INSTITUTO DE ASTROFÍSICA DE ANDALUCÍA

EXCELENCIA SEVERO OCHOA

CSIC

2020
Annual report

The **IAA-CSIC 2020 Annual Report** is the result of a collective process of the people who make up the Instituto de Astrofísica de Andalucía. We would like to thank all of them for their dedication and willingness to capture the best possible picture of what we do and what we work for.

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Cover image: HAWK-I view of the Milky Way's central region. ESO/Nogueras-Lara *et al.*

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Foreword

Antxon Alberdi
Director IAA-CSIC

Isabel Márquez
Scientific Director SO-IAA Project

For all human beings, 2020 will be kept on the historical records as the year that reminded us how fragile we are. The lock-down sent most of us home, while humanity workers at hospitals put their lives at risk to save people, and providers of basic means gave support to our necessities. Three very important events for the scientific-technical life of the IAA had taken place at the end of February: the launch of Solar Orbiter, the first visit to the IAA of our External Advisory Board and the award of the *Medalla de Andalucía*. We could not have anticipated that, after such a busy start to 2020, we would be mainly homebound for the remaining six months.

The visit of the IAA *External Scientific Advisory Board (ESAB)* was a success in all respects and resulted in a very positive evaluation for the IAA. In fact, the committee states in its report:

> *"The ESAB members very much appreciate the work that went into preparing for our visit, the open and detailed discussions we had with different groups and people at the institute, and the care of the direction and the administrative support put into the organization of the visit. These efforts, the written report, and the high-quality presentations delivered during our visit provide a clear view of relevant aspects of the IAA science, its personnel situation, recent success and future plans. We had also a clear view of the pertinence of the Severo Ochoa program and its impact of the institute since its deployment starting in July 2018, and the pertinence of its continuation in the future after the present term. We thank all the IAA members and extensively the CSIC for a very informative and interesting visit."*

ESAB provided also very valuable recommendations that have been implemented to improve the scientific life of the institute. On November 2020, we passed the mid-term review of the *Severo Ochoa – IAA* program, evaluation charged to an *International Advisory Committee* nominated by the Spanish Research Agency, obtaining the highest degree.

A couple of days after the ESAB meeting, on February 28th, the IAA received the ***Medalla de Andalucía 2020*** in the area of "Research, Science and Health". This is the highest recognition granted by the Andalusian government and recognized the international impact of the science and technology performed at the IAA.

At the beginning of February 2020 the ***Solar Orbiter*** mission, where the IAA is co-PI of the instrument PHI, was launched and is still now on its way to the Sun. At the moment of writing this foreword, Solar Orbiter just passed 8,000 kilometers from Venus. This is the second of the eight passes that this spacecraft plans to make, to propel itself and modify its trajectory in order to study in detail an almost unknown part of our star: the solar poles. Curiously, the space mission Beppi Colombo, in which the IAA contributes to the BeLA instrument, was flying just 552 kilometers from the surface of Venus in the same days. Beppi Colombo will explore Mercury, the closest planet to the Sun and the least studied of the rocky planets in our Solar System. Several months later, on July 2020, Solar Orbiter provided the first magnetic map of the surface of the Sun without human intervention and from space. Being the Sun in a period of low activity, no structures were visible in the intensity image, but magnetic structures were observed on its surface in the circular polarization map.

During 2020, researchers from the IAA published the most extensive catalogue of stars in the Galactic Center to date. It is the result of the **ERC Consolidator Grant Galactic Nucleus**, led by researchers from the IAA. Thanks to its unprecedented resolution, it has been possible to unravel the history of star formation at the Galactic Center, showing that it has not been continuous and presents steep ups and downs in star formation. Many other scientific and technological results during 2020 could be mentioned: the discovery of more than three hundred planet-forming disks around young stars in the Orion Clouds, illustrating the diversity of physical conditions in which this process can occur; the first technical light of the JPCam panoramic camera at the Javalambre Astrophysical Observatory; the **evidence of the existence of a second planet around Proxima Centauri**, with a minimum mass of about six times that of the Earth and the discovery of two super-Earths around the brightest red dwarf star (GJ887) in our galactic environment; the study with the EHT of the innermost jet structure of 3C279, in the close neighbourhood of the horizon scales of the supermassive black hole and the accretion disk; the experimental proof that **the seeds of the solid bodies** of the Solar System **looked like porous dust particles a few mm long**; the detection with *NOMAD@ExoMARS* of the green line of oxygen which provides information on the composition and dynamics of the Mars atmosphere; or the transformation of the Stingray nebula that has lost its brightness and changed shape in just two decades. All our results in 2020 have been published by in 270 publications in refereed journals, many of them showing our commitment in large surveys/projects/instruments such as GALANTE, CALIFA, ROSSETA, CARMENES, TESS, RED DOTS, EHT, J-PLUS, GALACTIC NUCLEUS, GAIA, MONOS, SMASHING, ALFALFA, OTELO, DESI, SOLAR ORBITER, Mars Express, ExoMars, ASIM, IPHAS, MEGARA, LeMMINGs, RadioAstron, SKA pathfinders and precursors, among others.

Concerning **CAHA**, on March 2020 the presentation of the proposals for legacy projects with present or newly proposed CAHA instrumentation, corresponding to the call released in December 2019, took place in an hybrid, almost fully online meeting, just before the pandemics shutdown. The Calar Alto Science Advisory Committee (SAC) was charged with the task of evaluating the proposals submitted. The evaluation considered the scientific strength of each proposal, the addition or maintenance of competitive instrumental capabilities where applicable, and the strategic value for the future of the observatory. The SAC recommended to proceed with feasibility studies for TARSIS and GAMAICA as a step to select one of the two projects in the future. Additionally, the SAC recommended the allocation of time to the legacy proposal corresponding to either TARSIS or GAMAICA, depending which one is selected after the feasibility study, once the instrument is operational. These feasibility studies were performed in 2020, and defended in spring 2021. On the other hand, three legacy proposals with existing instrumentation (CAVITY, KOBE and CARMENES-PLUS) were selected.

In this very special year, the IAA has also contributed to the **research on COVID**, in particular through the development of a prototype instrument to analyze surfaces contaminated by SARS-CoV-2 via polarimetric analysis, and the study of the influence of the State of Alarm in the light pollution levels.

Despite the evident difficulties during 2020, there were many technological developments with important contributions from the IAA Instrumental Development Unit (UDIT) for both space projects and ground-based instrumentation. The Solar Orbiter commisioning was performed via teleconference for the first time for a space mission due to the Covid-19 pandemic situation. UDIT has contributed to the instruments GALA & JANUS for the JUICE mission, to the Instrument Preliminary Requirements Review (IPRR) for **Comet Interceptor**, to the ENVISION con-

ceptual design review, to PLATO, to LAGRANGE, and to the instruments TuMag and SKIP onboard Sunrise III. Referring to ground-based instrumentation, UDIT has contributed to the CAHA (CARMENES-PLUS, GAMAICA and TARSIS) and OSN (MiMA) instrumentations, besides new developments for the ESFRI infrastructures ELT and EST. We are very proud of the fact that our colleague Conchi Cárdenas obtained the ***2020 MERAC Prize by the European Astronomical Society (EAS)*** for the best doctoral thesis in the field of new technologies (instrumentation). She received the award for her work *PANIC, una cámara infrarroja de gran campo para Calar Alto* (PANIC, an infrared wide-field camera for Calar Alto), based on her leadership qualities and her creative work in instrumentation related to the instrument PANIC.

IAA-CSIC is leading Spanish scientific and technological participation in the **Square Kilometer Array (SKA)**, supporting academic groups and industry, as well as the Ministry, acting as a national and international point of contact, performing the functions of a SKA Office in Spain. SKA will be the world's largest public data generator, with distributed processing centres interoperating around the globe (the so-called SKA Regional Centres, SRCs). Maximising the scientific return on Spain's investment in the SKA requires a platform that provides specific support to users through the creation of a SRC in Spain, integrated into the international network of SRCs. The year 2020 has been instrumental for the development of a prototype of the SRC at the IAA, developing technical capabilities and expertise to host an SRC, strengthening scientific activities related to SKA and its precursors/pathfinders, enhancing synergies for and beyond SKA, and fostering and enabling the application of Open Science principles.

As you have probably noticed, the format of this report is changed with respect to previous years, with the aim of providing a quicker and more visual look. We are pleased to share with you the panorama of the activities developed at the IAA in 2020.

IAA Organizational Chart

Director
Antxon Alberdi

Deputy Science Director
Isabel Márquez

Deputy Tech. Director
Luisa Mª Lara

Manager
Francisco Tapia

DEPARTMENTS

Solar System
Bernd Funke

Stellar Physics
Pedro J. Amado

Radio Astronomy & Galactic Structure
Emilio Alfaro

Extragalactic Astronomy
Rosa González

SERVICE UNITS

General services
Francisco Tapia

Outreach & Communication
Emilio J. García

Instrumental & Technological Development Unit
María Balaguer

Computer Center
José Ruedas

OBSERVATORIES

Calar Alto (CAHA)
Jesús Aceituno

Sierra Nevada (OSN)
Cristina Rodríguez

ADVISORY COMMITTEES

External Advisory Board

Institute Board

IAA overview

The **Instituto de Astrofísica de Andalucía** (IAA) is the largest Astronomy institute of the **Consejo Superior de Investigaciones Científicas** (CSIC)

The IAA research is supported by a number of research groups, covering most of the research topics in modern Astrophysics. This research is carried out within four different departments.

Research Groups

Solar System

- Solar Physics
- Planets and minor bodies
- Terrestrial Atmosphere

Stellar Physics

- Lowmass Stars
- Stellar Variability
- ARAE
- HETH

Radio Astronomy and Galactic Structure

- Stellar Systems
- PISM
- AGN jets

Extragalactic Astronomy

- Galaxy evolution
- Theoretical gravitation
- Observational Cosmology
- Cosmology and Astroparticle Physics

The **Instrumental and Technological Development Unit** (UDIT) and the **Computer Center** (CC) provide technical support to the research lines.

The IAA owns the **Sierra Nevada Observatory** (OSN) and is also the CSIC reference research center for the **Calar Alto Observatory** (CAHA).

Staff

213
Total member

Category and gender distribution

48 Permanent Staff (**9** Female / **39** Male)

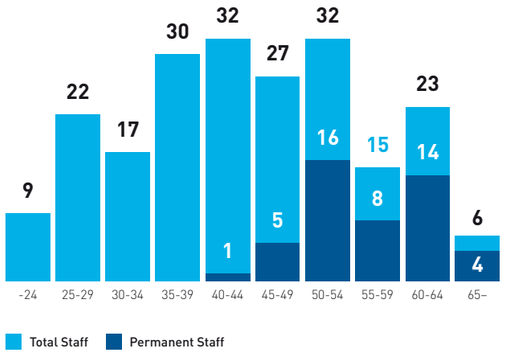
41 Postdoc Fellows (**15** Female / **26** Male)

33 Predoctoral Researchess (**10** Female / **23** Male)

67 Technicians/Engineers (**11** Female / **56** Male)

24 Services (**13** Female / **11** Male)

Age distribution



Detailed Cientifical and Technical Staff

- **25** /4 Scientific researcher
- **14** /4 Senior scientist
- **9** /1 Research professor
- **35** /13 Postdoc contract
- **4** /1 Ramón y Cajal
- **1** /1 MSC postdoc
- **1** Juan de la Cierva
- **21** /4 FPI
- **8** /4 PhD contract
- **3** /1 JAE-Intro
- **1** /1 MSC predoc
- **25** /3 Electronics
- **17** /3 Software
- **12** System engineering
- **5** /2 Mechanics
- **5** /2 Project Manager
- **3** /1 Optics

International Staff

27 people in **15** foreign countries

2020 results

267
SCI publications

38
seminars at the IAA

34
press releases

8
meetings and schools

14
theses (PhD, Master, Degree)

15
courses

6
awards (including the **Andalucía Medal 2020**)

14.2 M€
total budget

The IAA Severo Ochoa Programme

Isabel Márquez
Scientific Director SO-IAA Project

Even in the hard circumstances we all faced in 2020, the IAA Severo Ochoa programme kept running, with full respect to the sanitary circumnstances, and producing excellent results.

We confirmed a new electrical phenomenon in the **Earth's atmosphere**, the production of blue flashes by cold electrical discharges. The molecular mechanisn connecting oceanic iodine emissions and atmospheric particles, a process not yet included in chemical-climatic models, was revealed. We detected for the first time an elevated stratopause in Autum, whose ultimate origin is not entirely clear. We captured the very first magnetic map of the **surface of the Sun** without human intervention from space with SO/PHI, the instrument co-led by IAA onboard Solar Orbiter.

We showed, for the first time experimentally, that the seed of the solid bodies of the Solar System look like porous dust particles a few milimeters long.

With the instrument NOMAD on board ExoMars, we detected for the first time outside the Earth the green line of Oxygen in the **atmosphere of Mars.**

We put on evidence the existence of a second planet around **Proxima Centauri**, the closest star to the Sun. We participated in the discovery of a multiple planetary system around a massive star in the Solar environment called GJ887.

We participated in an ALMA and VLA joint work revealing a stellar nursery of hundreds of planet-forming disks in the **Orion clouds**. We captured with ALMA the evolution of a star in its way towards a planetary nebula, or the most probable binary nature of planetary nebulae with TESS. We provided the evidence of expansion at human time-scales in various **nova explosions**. We showed how the the Stingray planetary nebula, the youngest known, was fading through Hubble Space Telescope observations two decades apart.

We participated in the obtention of a movie showing how a **stellar black hole** ejects matter and interacts with the medium. This black hole belongs to a binary sistem with a sun-like star as companion. We participated in the identification of a source producing very short duration **radio bursts** in the Milky Way, most probably produced by a magnetar (a neutran star with a very strong magnetic field).

We published the new (DR2) **J-PLUS 12-band catalogue** with almost 20 000 000 celestial objetcs, which will have a strong impact in the study of the evolution of galaxies. We led a study revealing the existence of two rotating gas disks in the vicinity of the **super-massive black hole** in NGC7469, and a third component indicative of turbulent motions, thanks to the unprecedented velocity resolution of the MEGARA instrument at GTC. We participated in the detection, for the first time, of differences between the galactic disks of active and non-active galaxies, based on the comparison of pairs of twin galaxies from the CALIFA survey.

We participated in the first study with MHONGOOSE, a lecagy project with the SKA-MID precursor MeerKAT, showing the atomic Hydrogen distributions in some nearby galaxies with unprecedented quality.

We first unequivocally showed the connection between galaxy merging and jets, with the detection of a a jet of material at very high speed emerging from the supermassive black hole of a galaxy in collission.

We observed transversal apparent super-luminal motions in the base of the jet of the **quasar 3C279** with the EHT. A completely new window was opened towards the study of the time evolution of black holes with EHT, showing for the M87 black hole image that while the diameter of the ring remains constant with time, the ring is wobbling, revealing turbulent evolution of the **hot plama swirling arount M87**.

All our research produced 259 publications in refereed journals of the first quartile (Q1), more than one third led by IAA scientists. They provide a fair representation on the numerous projects we are involved in, among which we could highlight GALANTE, CALIFA, ROSSETA, CARMENES, TESS, Red Dots, EHT, EVN, J-PLUS, GALACTIC CENTER, GAIA, MONOS, SMASHing, ALFALFA, OTELO, DESI, SOLAR ORBITER, Mars Express, ExoMars, ASIM, IPHAS, MEGARA, LeMMINGs, RadioAstron, SKA pathfinders and precursors, etc.

Concerning our **protopype of SKA Regional Center**, the first stage of the platform was set up and started running. The Science Gateway started its implementation based on our participation on the H2020 ESCAPE project. We started the development of an archive prototype in collaboration with the technical group of the ASKAP precursor. User support was provided to four MeerKAT proposals involving eleven IAA members. An invited talk was given at the 75th United Nations General Assembly on the *Open Science for sustainability and inclusiveness: the SKA role model*.

Last but not least, contributing to the research on Covid-19 with our skills and tools, we have investigated the detection of **coronavirus on surfaces with our Cosmic Dust Laboratory**, and studied the impact of the strict confinement on the light pollution levels at the city of Granada.

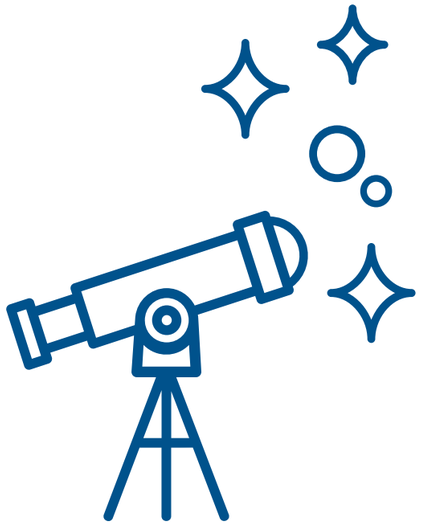
Among our activities, either incoming or outgoing visits were obviously cancelled or postponed. We tried to give support to all those researchers that were at the IAA when the lockdown started, and helped them to get back to their home countries (Italy, Japan, South Africa, Germany...). Our SO-IAA Technical Office, together with the IAA General Services Unit, had an unvaluable contribution to ease the whole process.

Nobel Prize Andrea Ghez
+ 300 live assistance (zoom)
+ 550 visits (youtube recording)

We transformed our Colloquia into a Web-loquia program, and hence kept open the access to high standard talks, which were attended by numerours researchers also from other institutions in Spain and abroad. Just to highlight two of the web-loquia, we had **Andrea Ghez and Didier Queloz, Nobel Prices in Physics in 2020 and 2019**, respectively. We also transformed our trainign activities into the online format, and had our *Introductory course to astronomy and astrophysics*, a course on *Gender analysis in research*, and **our first SO-IAA school** on *Machine Learning, Big Data and Deep Learning*, co-organised with the Andalusian Institute of Data Science and Computational Intelligence (DaSCI) of the University of Granada.

In addition to the SO-IAA report that was delivered and presented to the ESAB on February 2020, we also elabotared and presented the documentation required from the Spanish Research National Agency for the Mid-term evaluationt of the Severo Ochoa project that took place on November. We were given the highest score by the International Evaluating Committee.

Research lines



CSIC considers the research groups as specific fundamental units which contribute to achieving the scientific objectives of the institution.

The IAA has 13 active research groups, that belong to the global area of "Materia". At the IAA we cover all major fields of astrophysics and space science. Our research is based on the three pillars of modern astrophysics: Observation, instrumental development, and theoretical and numerical studies, all of which are firmly established and interconnected. The IAA groups study:

- **The Sun**, via spectropolarimetry, and their magnetic fields from an observational, theoretical and instrumental point of view: "Solar Physics Group".
- **The Earth's atmosphere** and planet atmospheres, including exo-atmospheric studies: "Group of Terrestrial Planet Atmospheres".
- **The planets** and the formation and evolution of minor bodies in the Solar System: "Planets and Minor Bodies Group".
- **The physics of planetary systems** and their low-mass stars: "Physics of low-mass stars, exoplanets and associated instrumentation Group".
- **The variability of stars** and asteroseismology: "Stellar Variability Group".
- **The stellar clusters**, massive stars and the Galactic Center: "Stellar Systems Group".
- **The formation, evolution and death of stars** at different mass and spatial scales and the interstellar medium: "Physics of the Interstellar Medium Group".
- **The galaxy structure** and evolution, from the inner stellar and diffuse components to their large-scale cosmic distribution and evolution: "Galaxy Evolution Group".
- **The supermassive Black Holes** and their inmediate environments, including their associated relativistic Jets: "Relativistic Jets and Blazars Group".
- The combination between **General Relativity and Quantum Mechanics** in astrophysical scenarios: "Theoretical Gravitation and Cosmology Group".
- The analysis of **large-scale galaxy clustering mechanisms** and the production of accurate cosmological simulations and galaxy mock catalogs: "Cosmology and Astroparticle Physics Group".
- The multirange observations of **high-energy phenomena** and theoretical stellar evolutionary models: "High Energy Astrophysics and Robotic Astronomy Group (ARAE)".
- **The explosive transients** and their host galaxy environments: "High Energy Transients and their Hosts (HETH) Group".

The following pages present a summary of the results obtained in 2020 by the different research groups. The publications corresponding to the different highlights are identified in brackets, with the correponding number in the publication list (from pag. 56 on).

STELLAR SYSTEM

Solar Physics

Photograph of the Solar Orbiter mission lift-off at Cape Canaveral.

Overview

The IAA's Solar Physics Group (SPG) focuses on solar spectropolarimetry from all the three points of view: theoretical, observational, and instrumental. Investigations and developments are carried out on:

- The radiative transfer equation (RTE) for polarized light in the presence of magnetic fields,
- The inversion of the RTE for its use on the interpretation of spectropolarimetric measurements in terms of the thermodynamic, magnetic, and dynamic parameters of the Sun,
- The structure and physical nature of all kind of photospheric magnetic structures,
- The design, development, and construction of solar instrumentation.

Research lines:

- Quiet-Sun and active regions magnetism
- Magnetic coupling of the solar atmosphere
- Diagnostic techniques in spectropolarimetry
- Solar cycle
- Solar instrumentation

Highlights in 2020

Temporal evolution of penumbral micro-jets (PMJ). The weak-field approximation reveals larger magnetic field changes in the upper photosphere than in the chromosphere during the PMJ maximum brightness stage. In the photosphere, the magnetic field inclination and strength undergo a transient increase for most PMJs, but in 25% of the cases the field strength decreases during the brightening. In the chromosphere, the magnetic field tends to be slightly stronger during the PMJs [232].

The scientific and instrumental description of the Polarimetric and Helioseismic Imager for *Solar Orbiter* were published with the co-leadership of the Solar Physics Group [233].

Trials were made to use **artificial neural networks to accelerate the process of interpreting spectropolarimetric observations.** The physical parameters inferred by the neural network show excellent agreement with the results from the inversion, and are obtained in a factor of 10^5 less time. Additionally, substituting the results of the neural network back in the forward model, shows excellent agreement between inferred and original spectra [171].

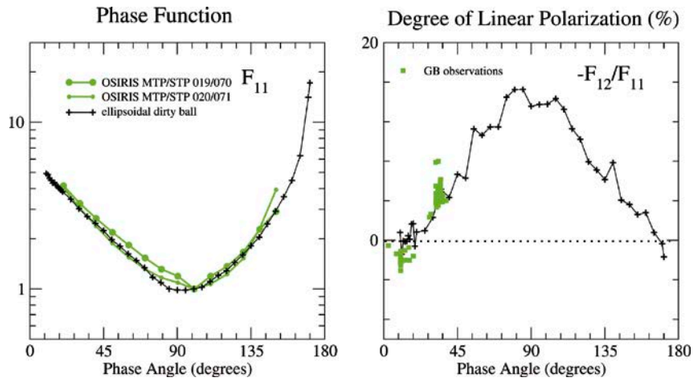
Instrumentation

- Pre-development study of the DPU for the ESA's *Lagrange* mission.
- Assembly and integration of the electronics unit of the SCIP instrument for *Sunrise III.*
- Further development of the TuMag and SCIP, in-house designed and manufactured, cameras.
- Launch of the ESA's *Solar Orbiter* mission.
- Group members started leading the international consortium for the development of the tunable imaging spectropolarimeters for the *European Solar Telescope.*

VOLVER AL ÍNDICE →

SOLAR SYSTEM

Planets & minor bodies of the solar system



Phase funcion (left) and degree of linear polarization (right) as a function of the phase angle of Comet 67p. Green points correspond to observations, and black points to measurements with CODULAB [179].

Overview

The activities of this group are focused on four research lines: planets, minor bodies, exoplanetary atmospheres, and the Cosmic Dust Laboratory (CoDuLab). Broadly speaking, we aim at providing an integrated view of the Solar System and the atmospheres around exoplanets. Observational projects are being conducted from the ground as well as by using instrumentation on board space vehicles. The data interpretation is based on theoretical modeling, numerical simulations, and laboratory studies. We are involved in a number of space missions such as BepiColombo, ExoMars, JUICE, or Comet Interceptor.

Research lines

- Planets and minor bodies of the Solar System
- Dust in the Solar System
- Exoplanetary atmospheres

Highlights

Characterisation of the large trans-Neptunian object 2002 TC302. Stellar occultation, photometry, and astrometry data were used to provide dimensions, possible presence of a satellite, and lack of atmosphere or rings on this TNO [187].

Stellar occultations by TNOs: from predictions to observations. A chapter in the book "The Trans-Neptunian Solar System", describing how stellar occultations unveil the physical properties of those bodies, and the presence of satellites or rings around them. (Ortiz *et al.*, Elsevier, 2020).

Identification of large and possibly oriented particles in comet comae. Observations of 67P dust coma by Rosetta/OSIRIS gave a pronounced u-shaped phase function that might be interpreted by large and oriented absorbing particles. CoDuLab measurements of the scattering pattern of large and porous grains with absorbing inclusions confirm the theoretical interpretation, and agree with ground-based measurements of the degree of linear polarization [179].

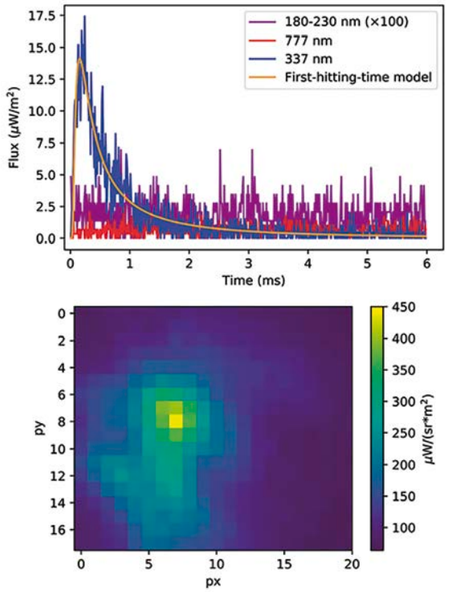
Aerosol formation by iodine emissions. A gas-to-particle conversion mechanism helps to explain atmospheric aerosol formation through clustering of iodine oxides [85].

Understanding the atmospheric regions of HD 209458 b from where the escape originates. Atmospheric escape from this exoplanet was investigated by high-resolution measurements of the He I triplet absorption at 10830 Angstroms and 1D hydrodynamical modeling [137].

Detection of green line emission in the dayside atmosphere of Mars. Although predicted some 40 years ago, the observation of this line in Mars atmosphere had been elusive. This is the first time the 557.7 nm oxigen line dayglow emission is detected in a planetary atmosphere outside the Earth, thanks to measurements by NOMAD-UVIS on board ExoMars Trace Gas Orbiter [83].

SOLAR SYSTEM

Terrestrial and planetary atmospheres



Photometer light curves (up) and 337 nm image (down) recorded by the MMIA instrument of ASIM onboard the International Space Station (ISS) corresponding to single-pulse corona electrical discharges in a thundercloud.

Overview

We investigate the thermal structure, composition, chemistry, dynamics and electricity phenomena of the Earth and planetary atmospheres. About the Earth, we focus on the study of solar particles and radiation effects on atmospheric composition, trends in temperature and species abundances, and the occurrence and impacts on composition of lightning phenomena. About Mars, we study its temperature structure, dynamics, ionosphere and composition. We use a large variety of models and measurements from instruments on satellites, on ground and in the laboratory. More recently we started studying the giant exoplanets' atmospheres by modelling and analysing ground-based CARMENES data.

Research lines

- Drivers of the Earth's middle atmosphere variability and its impact on climate
- Atmospheric Electricity in Planetary Atmospheres
- Thermal structure and composition of the Terrestrial planetary atmospheres. Remote sensing of planetary atmospheres in IR/UV
- Characterization of exo-atmospheres by modelling and analysis of ground-based and space measurements

Highlights

First Detection of a Brief Mesoscale Elevated Stratopause in Early Winter. The stratopause over the Northern pole jumped up 25 km in November 2009, the earliest in the season observed so far. It is very relevant, since it affects the downwards transport of NOx and H2O (with impact on stratospheric ozone) and on energy transfer through wave coupling [79].

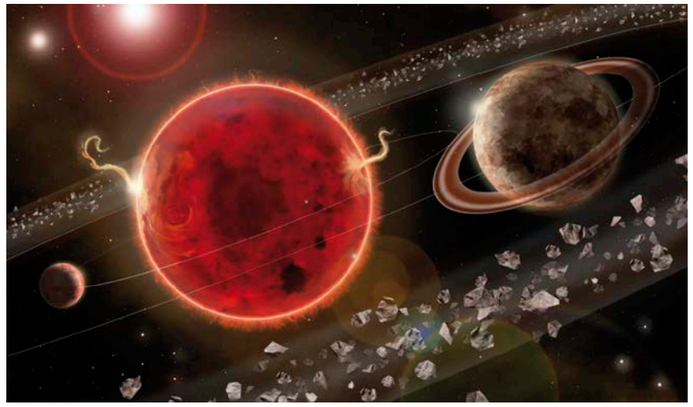
ASIM confirms that blue optical detections are in-cloud large corona discharges, not lightning. ASIM measured (from the International Space Station) a succession of blue (337 nm) flashes in the UV without the presence of 777 nm optical signals (indicative for lightning). We developed a new method (combining with ground-based radio signals) that allows the identification of the source's height inside thunderclouds. The results are important since corona discharges in thunderclouds can be a source of greenhouse gases like N2O and O3. [234 –JGR Editor's Highlight–]

The atmospheric evaporation is a key mechanism in exoplanets' evolution. The escape in these atmospheres had been studied so far through H Ly-α, but with large uncertainties. The He triplet line offers a new window for studying the hydrodynamic escape. We analysed He triplet measurements of the hot Jupiter HD 209458 b taken by CARMENES with a developed hydrodynamic model and found unprecedented constraints on its temperature and mass loss rate. Also, its upper atmosphere resulted to be lighter (H/He~98/2) than previously thought [137].

VOLVER AL ÍNDICE →

STELLAR PHYSICS

Low-mass stars & exoplanets



Artistic view of the system around Proxima Centauri. Source: Lorenzo Santinelli

Overview

Our group studies the physics of planetary systems and their low-mass host stars. M dwarfs are interesting by themselves and for their potential for the discovery of temperate rocky planets that could sustain liquid water. We work in several aspects of these systems, from the general statistics and observational distribution of their exoplanets to the asteroseismic modelling and magnetic activity of their host stars. The group has expertise in theoretical studies of stellar structure and evolution, magnetic activity, asteroseismology and technical development of new instrumentation. The group hosts the co-PI of the CARMENES consortium and one of the two PIs of the CARMENES Legacy-PLUS project.

Research lines

- Stellar structure and evolution of very low-mass stars
- Asteroseismology
- Exoplanets. Magnetic activity
- Astronomical instrumentation

Highlights

CARMENES (Quirrenbach *et al.* 2020) is a worldwide unique instrument, co-led by the IAA. It is collecting high-precision radial velocities simultaneously in the optical and the near-infrared in what is the largest exoplanet survey of red dwarfs to date. Its NIR channel, designed and built at the IAA, has shown to be a groundbreaking instrument for the study of exoplanet atmospheres, opening new lines of research in this field. In 2020, the **CARMENES Legacy-PLUS project was approved and started** enlarging and deepening the original survey.

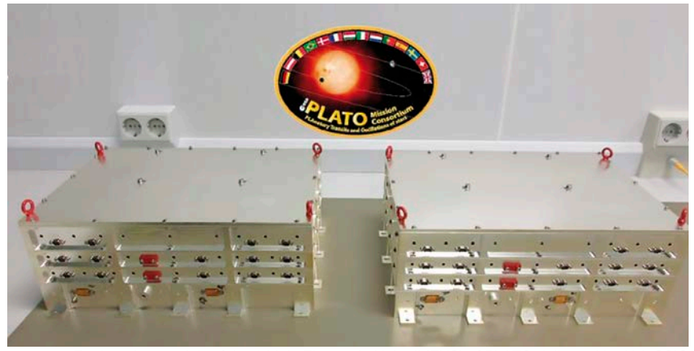
CARMENES has published, in-press, or submitted 76 papers and discovered 47 new planets. The CARMENES results have increased by 50% the number of planets in the parameter space probed by our instrument. In 2020, we continued our participation by leading the consortium and contributing to its work packages. We also continued our participation in the other large exoplanet survey in the southern hemisphere, RedDots [115], and in NASA's mission TESS.

We are discovering unique systems that deepen our understanding of close-in terrestrial and super-Earth planets, as for GJ 1061 [67], the third nearest known compact terrestrial multi-planetary system, or benchmark examples for the performance of our instrument like GJ 1057 b [25], a **super-Earth around a quiet mid-M dwarf**. The publication (with worldwide Press Release notes) of the detection of a **second planet around Proxima Cen** [57] and the **nearest known compact terrestrial multi-planetary system**, GJ 887 [115] also originate from this work.

To understand different aspects of planetary systems and their stars, we keep a line of research on stellar pulsations. In this line, we published the study of a selected sample of stars in NGC 6811, one of the four open clusters within the field of view of the original Kepler space mission [212]. All studied stars were found to be photometric variables, mainly as main-sequence Gamma Dor and Delta Sct-type pulsators. Interestingly, and contrary to expectations, **a high percentage of these stars showed variability modulated by their rotation**, which indicates that stellar activity is common on the surfaces of these hot stars.

STELLAR PHYSICS

Stellar variability



Engineering models of the 2 Main Electronic Units (MEUS) of PLATO delivered by IAA-CSIC

Overview

The Stellar Variability Group focuses mainly on the study of stellar structure and evolution and its impact on the characterization of exoplanets, stellar populations and galactic archaeology using asteroseismic techniques.
The group is involved in the development of theoretical models as well as innovative time series analysis techniques that can be applied to extract information from ultra-precise data, especially observations from spacecraft. Instrumental development is a fundamental part of the work of the group's technical team.
We have participated in the design and exploitation of the CoRoT space mission and, currently, we are strongly involved in the preparation of the PLATO (ESA) mission.

Research lines

- Stellar Structure
- Stellar Evolution
- Time Series Analysis
- Open Science

Highlights

Asteroseismology allows the study of stellar interiors by analysing how oscillations (manifested at the surface of the star as bright variations or Doppler shifts) propagate at different depths depending on their frequency.

The most informative and illustrative tool to analyse data from pulsating stars is the periodogram, since it shows peaks at the significant frequencies, thus allowing us to detect stellar pulsation periods. However, it is common to find peaks at other frequencies too, which are not solutions of the perturbed stellar structure equations though related to them. These are the so-called combination frequencies. This is the case in heat-driven pulsating stars such as RR Lyrae stars and Cepheids, white dwarfs, β Cepheids, δ Sct stars and slowly pulsating B-type (SPB) stars, or even γ Dor stars, where the excitation mechanism is convective flux blocking.

When many pulsation periods are present in the data, these frequencies can compromise the mode identification in asteroseismic analyses. In [138] **a method based on fitting the set of frequencies that best describes a general non-linear model** was introduced. The method allows these frequencies to be removed from data, thereby improving the frequency analysis and enabling hidden frequencies to emerge from what was initially considered as noise.

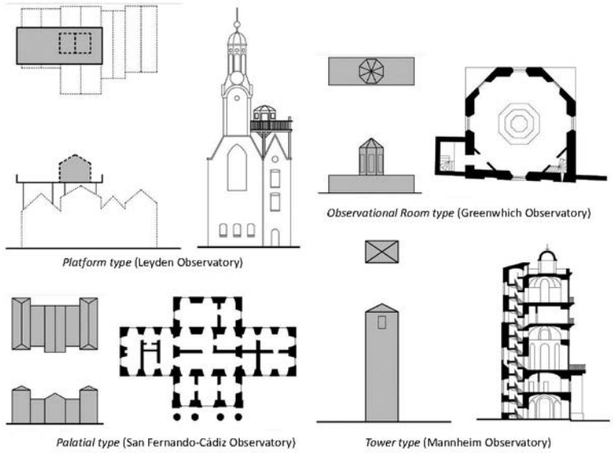
Technological highlights of PLATO, where IAA is responsible for the MEU (Main Electronic Unit).

- Delivery of MEU EM to PLATO Consortium at the DLR.
- Successful integration of the MEU EM (Engineering Model) unit at DLR with the rest of the electronic units: N-FEE, SIS PSUs, ICU EM, SIS TM/TC.
- Assembly of the structural/thermal units MEU MTDs at IAA and tests.

STELLAR PHYSICS

ARAE

(Astrofísica robótica y de altas energías)



Four of the proposed 10 observatory types as a showcase. [47]

Overview

The ARAE research group was founded in 2001 (under the auspices of the PAI), although some of its members had already started their activity in 1990. Scientists and engineers are working on a variety of projects, combining their strengths. Research areas are multi-range observations of high-energy phenomena, theoretical stellar evolutionary models and models of stellar population synthesis. Significant technological developments are also carried out, regarding the robotization of small/medium size observatories and astronomical instrumentation development such as the BOOTES network of telescopes. We are also involved in space-borne missions. Teaching, public outreach and citizen science are also part of the ARAE activities.

Research lines

- Stellar Physics Theory
- Compact Objects in the Galaxy
- Cosmic Gamma-Ray Bursts (GRBs)
- Gravitational Waves (GW) electromagnetic counterparts
- Robotic Astronomy
- Astrophysical Transients

Highlights

Gravity and limb-darkening coefficients for compact stars: DA, DB, and DBA eclipsing white dwarfs **[54]**

The distribution of the specific intensity over the stellar disk is an essential tool for modeling the light curves in eclipsing binaries, planetary transits, and stellar diameters through interferometric techniques, line profiles in rotating stars, gravitational microlensing, etc. However, the available theoretical calculations were mostly restricted to stars on the main sequence or the giant branch, and very few calculations are available for compact stars. In order to extend these investigations, we computed gravity and limb-darkening coefficients for different white dwarfs atmosphere models. The computations (for different photometric systems) were presented for a range of chemical compositions and gravity values and are now available via the Strasbourg astronomical Data Center (CDS) for the astronomical community.

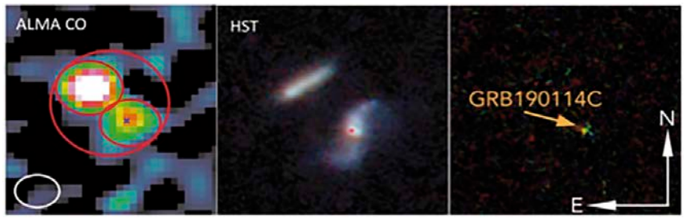
A typological study of astronomical observatories **[47]**

The development of Astronomy as a science, construction systems and technology has led to an unplanned evolution of astronomical observatories as buildings. These changes have been consolidated through a process of trial and error in which certain innovations were discarded, while some new features were consolidated and other modifications replaced pre-existing solutions. As one would expect, during this process there have also been some failed or partially erroneous projects. According to the constant evolution of the parameters that determine the needs and technical possibilities of the observatories, this paper classifies these astronomical centers, proposing 10 types in the development of astronomical observatories throughout history, and study the features that define them to establish a basic knowledge that will serve the designers of future projects.

STELLAR PHYSICS

HETH

(High energy transients and their hosts)



Hubble Space Telescope image showing the host galaxy system of GRB 190114C. This stellar explosion happened in the core of this interacting galaxy and produced very high energy photons of up to 1 TeV [61].

Overview

The "High-Energy Transients and their Hosts" (HETH) group studies stellar explosions and their galactic environments. HETH focuses on gamma-ray bursts (GRBs) and their hosts from an observational perspective, but also studies different types of supernovae (SNe), magnetars, compact objects and other peculiar transients. The group also develops new tools, techniques and instrumentation for astronomy. HETH members have been part of the teams developing GROND at the 2.2m telescope in La Silla or X-shooter (VLT) and won with OCTOCAM the bid for the Gem4#3 call for the 8.1m Gemini South telescope. This concept is the base for the GATOS instrument that was proposed for the 10.4m GTC.

Research lines:

- Explosive transients: Gamma-ray bursts, supernovae, fast radio bursts, unusual objects
- Electromagnetic counterparts of gravitational waves
- Host galaxies of astronomical transients: Spatially resolved with IFU and unresolved
- Starburst galaxies from low to high-redshift
- Late evolution stages of massive stars
- New instrumentation: OCTOCAM at Gemini, GATOS at GTC

Highlights

GRB 190114C in the nuclear region of an interacting galaxy **[61]**

GRB 190114C was the first GRB for which the MAGIC Cerenkov telescope reported the detection of very high energy emission (VHE) (MAGIC collaboration, 2019, Nat. 575, 459, several HETH members are coauthors). The emission likely originates from inverse Compton scattering in the GRB jet. HETH started a multi-wavelength follow-up campaign using ALMA, the VLT and HST (see Figure). These observations have resulted in several papers. In the one featured here we study the host galaxy of the event, that, contrary to many other long GRBs, occured close to the center of the, possible in a dense star cluster. The host has a close companion with which it is likely interacting. Both galaxies show strong CO emission, pointing to a dusty environment, unusual for a long GRB. We conclude that this dense environment might be crucial for the production of the observed high energy emission, which has only been observed in three other GRBs since.

NGC 2770: High supernova rate due to interaction **[170]**

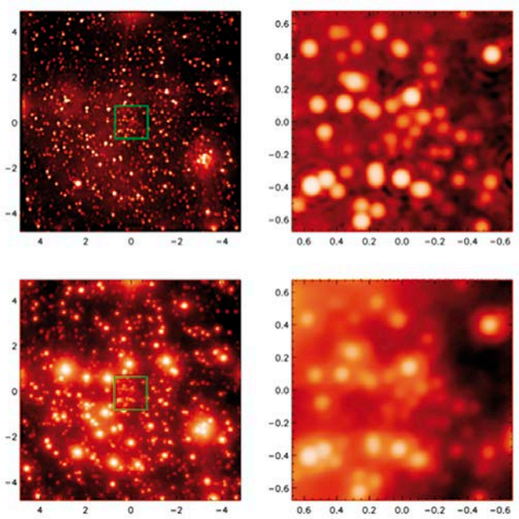
Some galaxies have been observed to host a much larger amount of supernovae than the average. NGC 2770 is one of these supernova factories and previous works had not been able to explain its high SN rate (four in the last two decades). This work studied the hydrogen content of the host his paper using HI and Hα observations. We concluded that NGC 2770 has an enhanced stellar production due to its interaction with several nearby companion galaxies some of which had not been identified previously.

GRANDMA observations of advanced LIGO's and advanced Virgo's third observational campaign **[14]**

GRANDMA is a collaboration to follow-up electromagnetic counterparts of gravitational wave sources. Several HETH members are part of the core team. GRANDMA is composed of 25 telescopes located literally around the globe. This paper describes the observing strategies and reports the follow-up campaign corresponding to the LIGO/VIRGO 3rd observing run, in which the collaboration observed 90% of the triggers produced by the gravitational wave observatories.

RADIO ASTRONOMY
& GALACTIC STRUCTURE

Stellar systems



Deep 0.06" resolution 2.17 μm images of thestellar cluster atthe Galactic Centre. The axes show offsets from Sagittarius A* in arcseconds North and East [228].

Overview

The Stellar Systems Group (SSG) was created in 1988. The group's development is based on the two basic concepts of internationalisation and specialisation. Our research lines are stellar clusters, massive stars, and the Galactic Centre. Currently, the group is studying the connection between star-forming processes and spatial and kinematic structures at different scales (http://ssg.iaa.csic.es), has finished an unprecedented study of the Galactic Centre region (https://ssg.iaa.csic.es/research/galacticnucleus-project) and is creating the most complete catalogue of Galactic massive stars to this date.

Research lines

- Galactic Centre
- Formation, evolution and destruction of Stellar Systems
- Massive Stars

Highlights

The Galactic Centre is the only nucleus of a galaxy that can be observed on milli-parsec scales. It is a unique target for understanding galactic nuclei and star formation in conditions that approach those in high-redshift star forming galaxies. The Galactic Centre group aims at understanding its structure and formation history and studies present day star formation in this region. Among the results obtained by the GCG in 2020, we provided:

New constraints on the structure of the nuclear stellar cluster at the centre of the Milky Way that indicate that the stellar population may change as a function of distance from the central black hole [78]. We also made a **study of the Milky Way's nuclear star** cluster that shows that it is one of the oldest structures in our Galaxy, that it has about twice solar metallicity, and that it displays the expected cusp of stars around the central massive black [228].

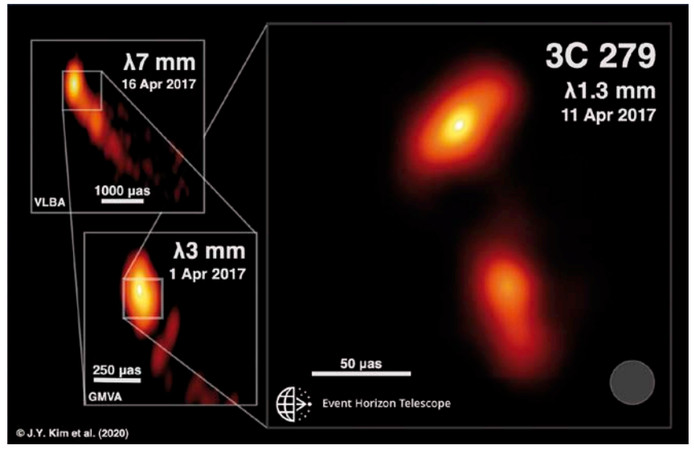
The Stellar System Group has as its main objective the study of the structure, formation and destruction of stellar systems. The astrometric and photometric data provided by Gaia represent the frontier, in quality and quantity, for studies of this kind. In addition, the group is involved in international observational consortia to obtain complementary data to Gaia that better help us to achieve these scientific objectives, such as Gaia-ESO Survey or GALANTE to name just a few.

We continued **the exploitation of the Gaia-ESO Survey data** (e.g., [45]), and tailored a pipeline for getting the stellar physical variables from GALANTE photometric data. In turn, we **check the reproducibility of the obtained results** in function of different stellar model sets used as templates [152]. However, the most relevant result obtained in 2020 is the improvement, development and application of a previous **method to determine the star cluster radius from Gaia DR2 astrometric data** [223]. This algorithm, based on the behaviour of the proper motions distribution for different spatial radii, has allowed us to create a catalogue of angular sizes for more than 700 stellar clusters.

RADIO ASTRONOMY
& GALACTIC STRUCTURE

AGN Jets

Relativistic Jets & Blazars



Event Horizon Telescope imaging of the archetypal blazar 3C 279 at an extreme 20 microarcsecond resolution [123].

Overview

The main research topic of our group is the study of supermassive black holes (SMBHs) harbored in the nuclear region of active galaxies. Huge amounts of energy are released from their innermost environment in the form of ultra-relativistic jets, as a consequence of mass accretion onto the SMBH and energy extraction through powerful twisted magnetic fields anchored to it. We study these objects at the maximum achievable angular resolution by means of very long baseline interferometry observations at radio wavelengths with the Event Horizon Telescope (EHT) and the space antenna RadioAstron. Thanks to these instruments, we are able to directly image SMBHs and the jets forming close to them.

Research lines

- Imaging supermassive black holes with the Event Horizon Telescope
- Accretion onto supermassive black holes and the formation of relativistic jets
- Blazar jet multi-wavelength phenomenology from the horizon to parsec scales
- AGN, black hole growth and demographics, binary blackholes and gravitational waves

Highlights

The **prototypical quasar 3C 279** is one of the best-monitored sources in the sky, as it has provided the **first signs of apparent superluminal motions**. The EHT observed the source at 1.3 mm on 2017 April 5, 6, 10, and 11. Out of these observations, we reconstructed the sharpest image ever of 3C 279 (see main figure) at an angular resolution of 20 micro-arcseconds (1700 Schwarzschild radii). The combination of the observed data revealed an elongated nuclear structure, in spatial scales close to the jet apex. Additionally, day-to-day structural variability was detected, matching the model of traveling shocks or instabilities in a bent, and maybe rotating jet. Lastly, the low intrinsic brightness temperature indicates that either the local plasma is optically thin at the given frequency or the energy budget at those spatial scales is magnetically dominated [123].

Jointly with 11 radio-telescopes across the Earth, the orbiting antenna RadioAstron observed the **BL Lac object 0716+714** in January 2015. We were able to detect the source at a maximum ground-space distance of 5.6 Earth diameters, which allowed us to resolve the innermost region of the relativistic jet emanating from the SMBHs environment with an **unprecedented angular resolution of 24 micro-arcsecond**. The polarimetric images obtained revealed complex structures and a remarkable curved morphology in the inner 100 micro-arcseconds, along with signatures of a helical magnetic field threaded to the jet plasma flow [132].

PG1553+113 is the first blazar showing a ~2 yr quasi-periodic pattern in its gamma-ray light curve. This behavior might be related to the precessing nature of the jet and the peculiarities in the central black hole(s) system, or to accretion rate modulations. We investigated the source pc-scale radio emission properties with a multi-frequency and multi-epoch very long baseline array monitoring. We find a limb-brightened jet, with a time variable position angle, and no clear periodic patterns in the radio light curve. This indicates that, besides geometrical effects, additional mechanisms are required to explain the high-energy emission variability pattern. Moreover, the intrinsic brightness temperature indicates that the energy in the core region is dominated by the magnetic field [145].

VOLVER AL ÍNDICE →

RADIO ASTRONOMY
& GALACTIC STRUCTURE

Physics of the Interstellar medium

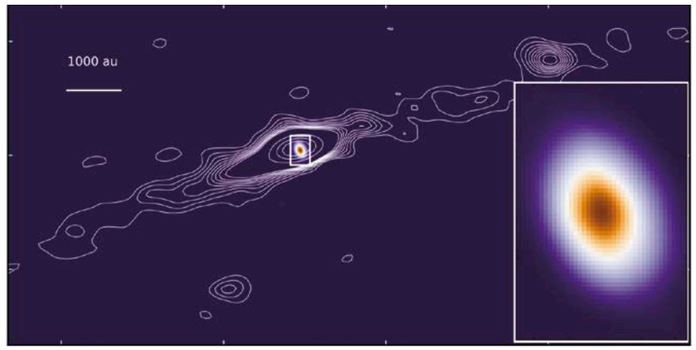


Image at radio wavelengths of the emission from the ionized HH80-81 jet (contours) and the dust emission in the associated disk (color). The inset in the lower left corner shows a close-up of the disk [12].

Overview:

We study the formation, evolution and death of stars at different mass and spatial scales across different environments. The early stages of star and planet formation are studied through radio interferometric observations and modelling of the observed emission.The final stages of a star's life are studied by the multi-wavelength characterization of evolved stars and the wind-blown bubbles around them, to understand the processes that shape planetary nebulae and the circumstellar medium around massive stars. Exoplanetary systems are studied through the observation of the radio emission from star-planet interactions. Radio interferometric monitoring of supernova explosions and their distribution in Ultra Luminous Infrared Galaxies is also carried out to determine the SN and star formation rates.

Highlights

Nova explosions are non-destructive thermonuclear runaways taking place on the surface of white dwarfs accreting material from a companion. An investigation of the angular expansion of a sample of five nova shells has allowed us to conclude that the nova ejecta has free expansion until it disperses into the interstellar medium, i.e., **the material ejected in these events is not slowed down by the circumstellar medium** [225]. This result has significant implications for the determination of the time-span of nova shells and so for their rate and recurrent time-lapses.

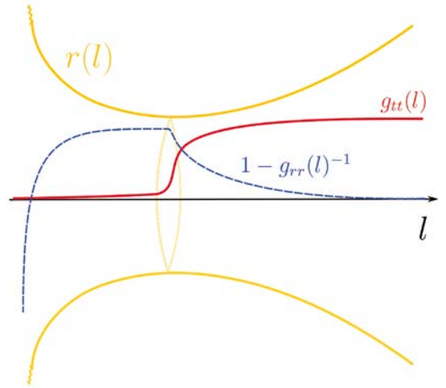
It has been well established that planet formation takes place in so-called protoplanetary disks. These are frequently found around young, low-mass stars, but their presence around high-mass stars is less well studied. We have carried out the **first detailed modeling of a disk around a massive protostar**, the one driving the HH80-81 system [12] that has been imaged by ALMA with a degree of detail similar to that of protoplanetary disks in low-mass stars. Our modeling reveals that the disk is hotter than similar low-mass disks, with temperatures above 200 K everywhere in the disk, thus precluding the formation of Jupiter-like gaseous planets in this environment, and allowing only that of rocky planets.

Research lines

- Massive stars and their surroundings. Supernova remnants and wind-blown bubbles
- Star and planet formation. Modeling and observation
- Planetary nebulae and their precursors
- Star-planet interaction of exoplanetary systems
- Luminous and Ultra Luminous Infrared Galaxies
- Prospective Science work for the Square Kilometre Array

EXTRAGALACTIC
ASTRONOMY

Theoretical Gravitation & Cosmology



Spherically symmetric solutions of vacuum semiclassical General Relativity. They have the form of asymmetric wormholes (radial shape in yellow) instead of the black-hole form of their classical counterparts.

Overview

Our group is interested in theoretical gravity, both at the classical level and specially on those situations in which General Relativity (GR) is expected to start failing. The most promising situation in which to observe departures from GR is the physics of gravitational collapse and its end result –black holes in the standard theory. Thus, a large part of our research is centered in analyzing how different situations in standard GR would be modified when going beyond this theory. For instance, we analyze modifications based on semiclassical gravity and those suggested by emergent and analogue gravity scenarios. We study the viability of the new scenarios suggested by these frameworks.

Research lines

- Gravitational collapse and semiclassical gravity
- Black holes and ultracompact objects
- Analogue and emergent gravity
- Group theoretical quantization
- Origin of masses of elementary particle

Highlights

Schwarzschild geometry counterpart in semiclassical gravity **[16]**

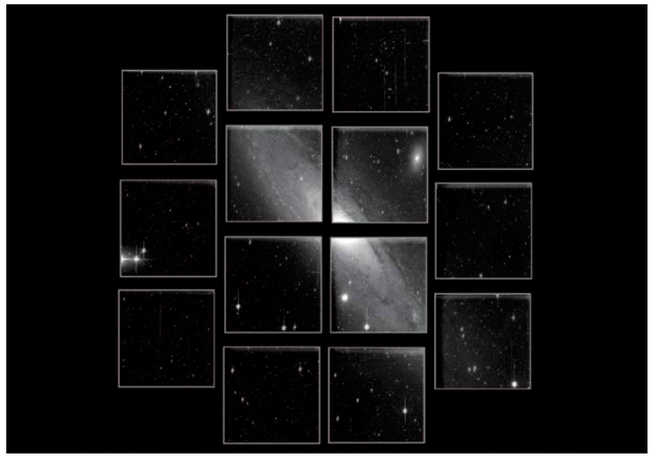
Semiclassical gravity is the most conservative way to incorporating into GR the first modifications caused by the quantum nature of matter and the vacuum. The quantum vacuum is understood as a non-empty entity which can become a source of the Einstein equations even in the absence of matter. The contribution of the quantum vacuum to the stress-energy tensor can be renormalized to zero when the spacetime is flat but not any more when the spacetime acquires curvature. We solved self-consistently the equations of semiclassical vacuum GR in spherical symmetry. It is well known that the solutions of the classical equations are Schwarzschild black-hole spacetimes with different masses. Instead, we found that the solutions to the semiclassical equations are asymmetric wormholes with different neck sizes. These wormholes does not have any horizon and develop a null singularity in an internal asymptotic region. To understand these solutions is necessary intermediate step in understanding stellar semiclassical configurations.

Asymptotic horizon formation, spacetime stretching and causality **[22]**

In our group it was proved that semiclassical effects can become significant in geometries in the verge of developing horizons or when some stretching is present. We took an entire family of geometries of this sort and analyze them from the causal point of view. The family splits into two subfamilies. In one we show that almost in all the situations there appear a Cauchy horizon beyond which the geometry can be extended. On the other subfamily the geometry is non-extensible but has two null infinities on either side of the horizon. We also analyze whether to attain these geometries it is necessary or not to violate the energy conditions of GR.

EXTRAGALACTIC
ASTRONOMY

Galaxy Evolution



Technical First light Image of M31 with JPCam. Credit: CEFCA. The IAA Scientific Team of J-PAS has an important contribution from the Galaxy Evolution Group.

Overview

The group conducts observational and theoretical studies on galaxy structure and evolution and cosmology. These range from the inner stellar and gaseous components of galaxies to their large scale cosmic distribution and evolution. We also participate in instrumental and technological projects. The main topics include star formation, the diffuse medium in stellar clusters and in galaxies and galaxy groups and clusters, the nuclear activity in galaxies and their interplay with stellar evolution, or the environmental dependence of the structure and evolution of galaxies. These activities include supervising PhD, teaching at master and doctoral levels, public outreach conferences, and eScience.

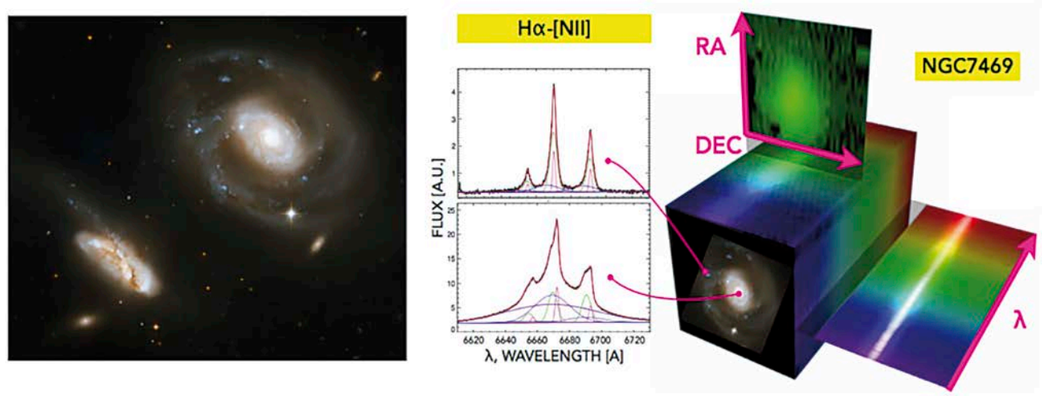
Research lines

- Active Galactic Nuclei
- Astronomical instrumentation
- Cosmic evolution of galaxies
- Open Science
- Physics of Quasars
- Star formation and violent star formation in galaxies
- Synthesis of stellar populations
- The interplay between massive star formation and chemical evolution in galaxies
- The influence of the environment on the evolution of galaxies

Highlights

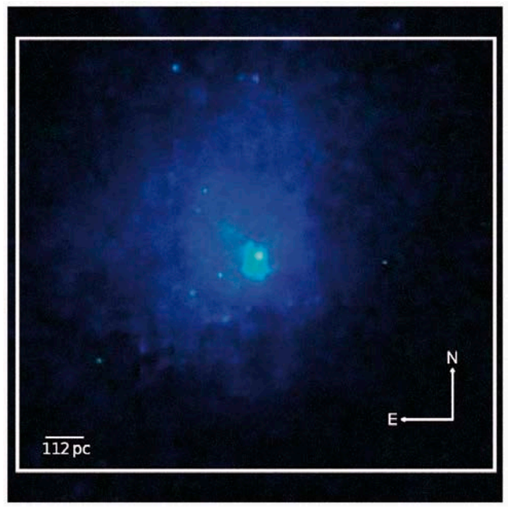
The circumnuclear region of the active galaxy NGC7469 was studied [49] at the **highest spectral resolution** (R-20 000) provided by the integral field spectrograph MEGARA attached to the Gran Telescopio Canarias. The unprecedented resolution allowed the detection of three emission line kinematic components in the ionized gas. Two of these components correspond to disks that co-rotate in the sample plane, one thinner than the other; star formation seems to be the dominant mechanism of ionization in the thinner disk, whereas shocks ionize the second disk. The third kinematic component does not show any rotation and is ascribed to non-rotational, turbulent motions most possibly associated to the presence of winds or outflows. In the very nuclear region of NGC7469 (at distances to the nucleus smaller than 1.85 arcseconds), a very broad (FWHM=2590 km s–1) Hα component contributes to the emission in the spectral region of Hα-[NII], tracing the broad line region of the Seyfert nucleus.

Mapping the ionized gas of the metal-poor H II galaxy PHL 293B with MEGARA [120]. PHL 293B is a local, extremely metal-poor, high ionization galaxy. This makes PHL 293B an excellent analogue for galaxies in the early Universe. Bidimensional spectroscopic observations with MEGARA@GTC report low intensity broad emission components and blueshifted absorptions in the Balmer lines (Halpha, Hbeta) which are located in the brightest zone of the galaxy ISM. A chemically homogeneity, across hundreds of parsecs, is observed in O/H, taking the oxygen abundance 12+log (O/H) = 7.64 ± 0.06 derived from the PHL 293B integrated spectrum as the representative metallicity for the galaxy. These IFU data reveal for the first time that the nebular He IIλ4686 emission from PHL 293B is spatially extended and coincident with the ionizing stellar cluster, and allow to compute its absolute He˙II ionizing photon flux. Wolf-Rayet bumps are not detected excluding therefore Wolf-Rayet stars as the main He II excitation source. The origin of the nebular He IIλ4686 is discussed.



The Seyfert galaxy NGC7469 and its companion (left). MEGARA observations al allow the detection of the various kinematical components [49].

The AMIGA team continued its deep involvement in the preparation of SKA. In science, we highlight the study of the ALFALFA (Arecibo Legacy Fast ALFA survey) sample to obtain the **HI mass function (HIMF) of galaxies in groups** [116]. We obtain that for dwarf galaxies the distribution is significantly flatter than for the full sample, consistent with studies of individual groups. This is part of a line of research focused on the study of groups. Together with previous works, this led AMIGA to be awarded with telescope time in the first MeerKAT Call open to the international community to study Hickson Compact Groups.

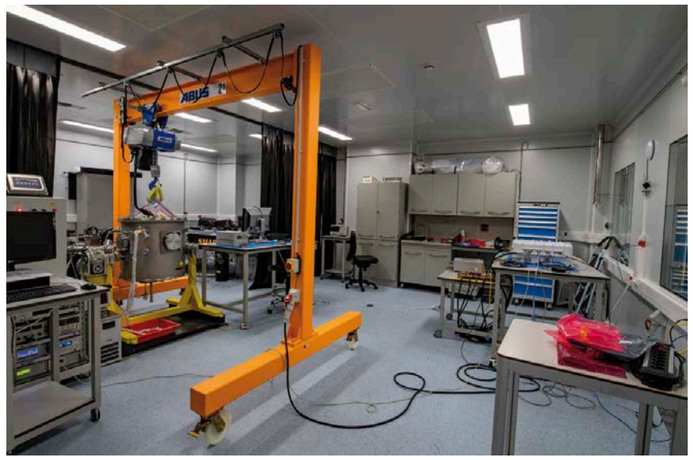


Color composite HST image of PHL 293B [120]

Technological activities included the contribution to the development of the Science Analysis Platform for the European Open Science Cloud (ESCAPE -H2020). The SKA Regional Centre (SRC) prototype platform was deployed and used in the SOMACHINE 2020 school, with support from the IAA Severo Ochoa programme. AMIGA also contributes to the design of the international SRC network. The team is becoming a reference in promoting SKAO as a role model for Open Science and inclusiveness, a topic in which AMIGA P.I. was invited to give a talk in the SKA session held at the 75th anniversary of the UN General Assembly. SKA coordinating activities continued, including contribution to the negotiation of contracts for Spanish industry.

UDIT

Instrumental & Technological Development Unit



UDIT laboratories

Overview

Since its foundation in 1975, the Instrumental and Technological Development Unit (UDIT) has focused on the development of state-of-the-art instruments for ground-based telescopes and space-borne astrophysical payload instrumentation. The instruments developed at the UDIT have placed the IAA as a reference center for technological research projects.

The technical production at the UDIT covers the analysis, design, integration, and verification of astronomical instruments in two main areas:

- Ground-based telescopes in Calar Alto Observatory (CAHA), Sierra Nevada Observatory (OSN), ELT (Extremely Large Telescope)
- Interplanetary scientific space missions and stratospheric balloon observatories

Activities in 2020

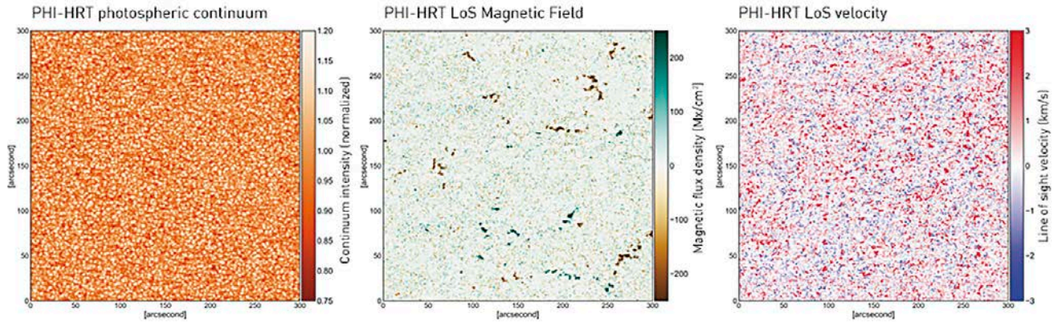
Ground based instruments:

MOSAIC *(Multi-object spectrograph for ELT)*: The IAA contributes with the hardware and control software for the cryogenic mechanisms of the IR spectrograph. The activities in 2020 were focused on the design, assembly and testing of the first hardware prototype: two CPUs, two motors and I/O boards and a motor control board. The second version of the ESO high level software was also tested.

MIMA *(Multi-Spectral Imager Mesopause Airglow):* Based upon a well-proven concept of the instrument SATI (OSN), MIMA is a portable ground based image (2D) VIS-NIR spectrometer with 5 channels for long-term monitoring of mesopause changes. In 2020, most of the mechanical parts of the instrument were manufactured and the MIMA Control Software (MCS) which is in charge of managing the system (filter wheel, CCD, temperature control...), was released, tested and ready for the AIV campaign.

GALIUS *(GrAnada LIghtning Ultrafast Spectrograph)*, is a portable, high spectral resolution imaging spectrograph that achieves unprecedented high speeds. In 2020 it allowed the detection of CO in rays using spectroscopy, which was confirmed with complementary chemical techniques. Additionally, an estimation of the temperature and pressure radial profiles with high velocity spectroscopy was carried out, as well as estimations of temperature maps from images taken with a beam splitter (at 700 kfps). A cryostat was manufactured to perform discharges and arcs at different pressures (100 -1000mbar) to analyze optical spectrum and electrical characteristics.

CARMENES-PLUS is aimed at upgrading the CAHA instrument CARMENES. In 2020 the instrument current radial velocity long-term stability was improved from 8 m/s to 1 m/s. Also the final designs of the automatic vacuum system for cooling lines and that of the warm-up system for the exhaust gas at the exit were carried out.



Results of the RTE (Radiative Transfer Equation) inversion performed on board the instrument PHI for the Solar Orbiter mission.

Concerning other CAHA instrumentation, the UDIT continued to work in **PANIC** *(Panoramic Near Infrarred Camera for Calar Alto)* through the adaptation of the instrument software to the new detector. The UDIT also participated in the **feasibility studies** of the two potential instruments for next generation instrumentation, GAMAICA and TARSIS. **GAMAICA** is a multiple spectrograph, with 4 channels (extended to 8) fed by IFUs. The IAA participated in the assessments for the pre-optics, front-end optics and optical fibers, and also carried out the project management and systems engineering tasks. **TARSIS** is a new wide-FoV, blue-optimized, intermediate-resolution Integral Field Spectrograph (IFS). The IAA participated in the definition of the instrument control package concept.

Space projects

PHI *(Polarimetric and Helioseismic Imager for the ESA mission Solar Orbiter, SO)*. The IAA is the PHI co-PI institution and its Solar Physics Group (SPG) coordinates the Spanish team. The IAA is also responsible for the electronics unit and the harness work packages and scientific core of the instrument, the RTE inversion algorithm implemented in an FPGA. The SO mission was successfully launched in February and in 2020 the main technological activities were focused on the PHI instrument commissioning.

GALA *(GAnymede Laser Altimeter)* and **JANUS** *(Jovis, Amorum ac Natorum Undique Scrutator)* for the ESA mission JUICE. The IAA is responsible for the power supply modules of both instruments, and the filter wheel and mechanism controller module of the JANUS camera. In 2020 the flight model and flight spare of the JANUS filter wheel and GALA power supply were successfully tested and delivered.

PLATO *(PLAnetary Transits and Oscillation of stars).* The IAA is responsible for its 2 *Main Electronic Units* (MEUs). Each MEU is equipped with 6 *Digital Proccessing Units* (DPU) and 2 SpaceWire routers also under IAA responsibility. In 2020 several Engineering Models for different purposes were tested and delivered. One was successfully integrated with the ICU Engineering Model. The IAA also worked in the MEU *Mass Thermal Dummie.*

SUNRISE III is the third mission of the Sunrise solar 1m telescope. The IAA manages the TuMag instrument consortium and is responsible for the electronics, harness, control software and the electronics and mechanics of the scientific cameras of TuMag and SCIP. In 2020 the SCIP Flight Model cameras and E-Unit were manufactured, tested and delivered to NAOJ team. The TuMag CDR was held and the flight model cameras were manufactured.

Lagrange is an ESA mission proposal within the ESA's Space Situational Awareness Programme. In 2020, the IAA worked in several pre-developments for the Polarimetric Magnetic field Image instrument. The major effort was devoted to the definition of the PMI DPU concept, an optimized, novel approach based on PHI PDU.

EnVision is an ESA orbital mission proposal to Venus to perform high-resolution radar mapping and atmospheric studies. In 2020, the IAA worked in the preparation of the CoDR documentation package for the power supply of the instruments VenSpec *(Venus Spectroscopy)* and VEM *(Venus Emision mapper)*.

Comet Interceptor is an ESA mission that comprises three spacecrafts, to study a pristine comet. IAA worked during 2020 in the Instrument Preliminary Requirements Review (IPRR) and participated in an ESA contract for the development of prototypes for the DPU of the instruments EnVisS and OPIC, and the power supplies for other instruments.

Calar Alto Observatory (CAHA)

3.5 m telescope at CAHA

Overview

CAHA is a Spanish Unique Scientific and Technical Infrastructure (ICTS), and is the most important observatory with optical telescopes in continental Europe. Its main telescopes have apertures of 1.23, 2.2 and 3.5 metres. It also has a fireball detection system that covers the whole sky visible from the observatory. The telescopes provide a wide variety of astronomical instrumentation in the optical and near-infrared range, as well as direct image sensor cameras and low-, high- or very-high-resolution spectrographs.

Highlights

A group of astronomers from the University of Guanajuato (Mexico) and from the CALIFA survey collaboration studied the effects of gravitational perturbations on the star formation rate in a subsample of CALIFA galaxies in the Local Universe. They found that regions hosting recent star formation in perturbed galaxies follow a different star formation rate vs. stellar mass relation, compared to non-perturbed ones.

The difference found in star forming regions of perturbed galaxies compared to those of non-perturbed galaxies could be indicative that encounters with nearby galaxies generate radial gas flows toward the centers of galaxies. In turn, these flows enhance the star formation rate of the internal regions of perturbed galaxies. *Star formation in gravitationally perturbed galaxies.* Morales-Vargas, A. *et al.*, MNRAS 499, 4370 (2020)

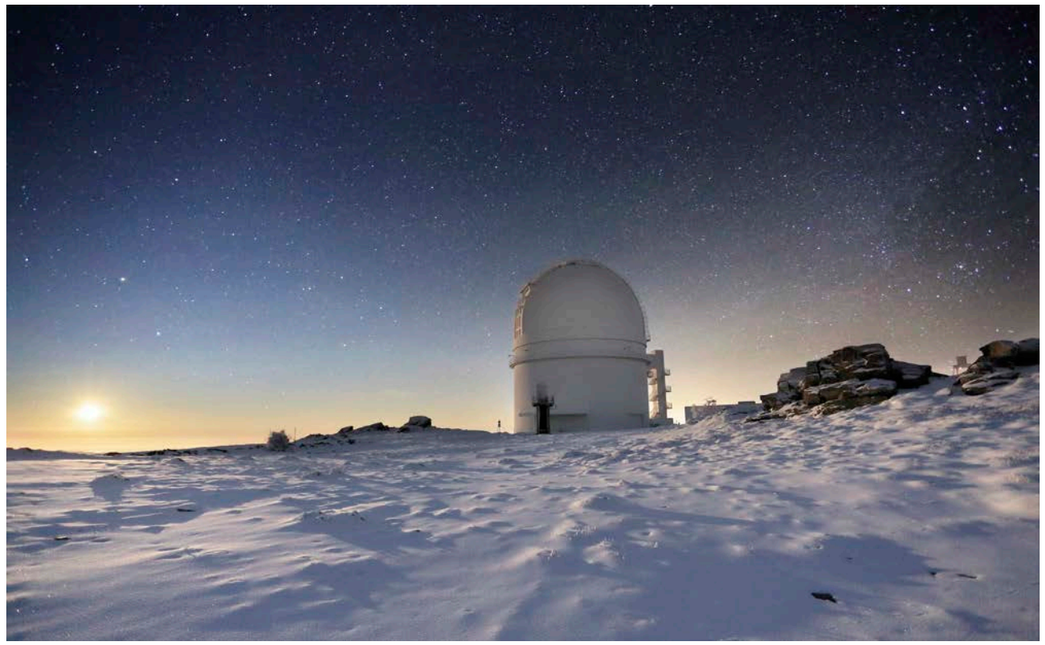
***Habitable moons around cool nearby stars: from science fiction to reality* [255].**

Observations with the CARMENES spectrograph have revealed relevant information on the M-dwarf planetary system CJ 1148. This system, known to host two gas giants exoplanets, one of them CJ 1148b orbiting in the habitable zone. Using refined dynamical analysis of CARMENES data, and self-consistent dynamical models suggest that although there is a narrow stability region around this planet where exomoons could exist, they would exhibit quick orbital decay due to tidal interaction with the planet. Thus, any sufficiently large exomoon that could sustain an ocean or an atmosphere would become a victim of the system's unique dynamics.

Promising scientific and technological new developments for Calar Alto

On March 12th-13th 2020, a workshop on new instrumentation and legacy projects for Calar Alto was held at IAA-CSIC headquarters. From the several projects presented in this workshop, the CAHA Scientific Advisory Committee selected three observational legacy projects:

Credit: Laura Hermosa-Muñoz & Juan R. González Fernández



- **CAVITY** *(Calar Alto Void Integral-field Treasury surveY)*: observations with PPAK/PMAS of galaxies inhabiting the loneliest regions of the local Universe.

- **KOBE** *(K-dwarfs Orbited By habitable Exoplanets):* observations with CARMENES of K-dwarfs orbited by potentially habitable exo-planets.

- **CARMENES Legacy-plus:** extension of the CARMENES survey, detection and characterizations of planets around M-dwarfs, the occurrence rate of long-periodgiant planets – GJ3512-like planets – and the characterization of exoplanet atmospheres.

In addition, the conceptual designs of two new generation instruments, both co-led by researchers of the IAA-CSIC were also preselected for the feasibility study phase, after which one of them will be selected for construction:

- **TARSIS** *(Tetra-ARm Super-Ifu Spectrograph)*, co-led by Complutense University of Madrid and IAA-CSIC, presents a design optimized for the UV range to study cosmological evolution through the observation of distant galaxies.

- **GAMAICA** *(Galaxy Mapper Instrument at Calar Alto),* co-led by the Astrophysics institutes in Postdam and IAA-CSIC, mainly targets the local Universe, namely the Andromeda galaxy and galaxies in Virgo, the closest cluster of galaxies.

- Last but not least, an upgrade of the CARMENES instrument –called **CARMENES-PLUS**– is foreseen to improve the already remarkable stability of its infrared channel. This update will allow to extend its successful search for rocky planets around a new and large sample of M-type red dwarf stars, in addition to fine tune its ability to detect and characterize atmospheres possibly similar to the one of the Earth.

A more sustainable observatory: Calar Alto will be converted into an "energy island"

The Calar Alto Observatory, the largest optical observatory in mainland Europe, will partially replace its energy sources in the next months to reduce its ecological footprint, thanks to a European Regional Development Fund (ERDF/FEDER).

By implementing the Calar Alto energy island, we intend to be a world reference for other professional observatories as a management model that helps the environment, with an estimated reduction of a hundred and sixty tons of carbon dioxide per year and the resulting optimization of the associated costs.

The project includes the installation of a biomass boiler to substitute diesel fuel for heating and hot water, a solar power production system, and changing the observatory vehicle fleet for electric cars.

On one hand, this project aims at optimizing the way we consume and produce energy at the observatory. On the other hand, we want to demonstrate that it is possible to guarantee the power supply in extreme climatic conditions for a high-tech facility, in altitude, while generating savings and reducing enormously our impact on the environment.

This project is funded by the ERDF/FEDER program ICTS2017-07-CAHA-4 and by the ICTS support program CAHA-16-CE-3978.

Solar Orbiter spotted with the Schmidt two days after launch. February 12th 2020

Using the Calar Alto Schmidt telescope remotely from Italy, a team from the *Planetary Defence Office of the European Spatial Agency* (ESA) managed to observe the Solar Orbiter satellite and booster two days after launch from Cape Canaveral. The observations were obtained in coordination with ESA's *Near-Earth Object Coordination Centre* (NEOCC).

After the ESOC's Mission Analysis team computed an accurate post-launch trajectory, the Schmidt telescope pointed to the expected position, and Solar Orbiter was indeed recovered in the field.

Solar Orbiter is now on its way towards Venus, before heading finally to the Sun. By 2022 and for a nominal duration of seven years, it will give us for the first time a close-in view of the poles of our star, so important for the understanding of the solar wind and the magnetic field, which have strong consequences on our life (and telecommunication system) on Earth. Solar Orbiter includes the SO/PHI instrument co-led by a team from IAA-CSIC in Granada.

OSN
Sierra Nevada Observatory

Overview

The OSN is a high mountain observatory, operated by the IAA, located at 2896 m altitude within the Sierra Nevada National Park (Granada, Spain). Its main building hosts two Nasmyth optical telescopes with a 90 cm and a 1.50 m mirror, (hereafter T90 and T150), both equiped with 2048x2048 CCD cameras, and the T90 also with a Strömgren-Crawford simultaneous six-channel photometer. In addition, the OSN has other secondary facilities, e.g. an Spectral Airglow Temperature Imager, dedicated to the study of the high layers of the Earth's atmosphere or five high-sensitivity CCDs dedicated to meteoroid detection.

The OSN also hosts equipments for external collaborations, like a fireball-meteoroid detection station from the University of Huelva (SMART project) that monitors the sky to analyse the interplanetary matter impacting our planet. In the geoscientific field, a GPS station (Topo-Iberia project) performs integrated studies on topography and 4-D evolution.

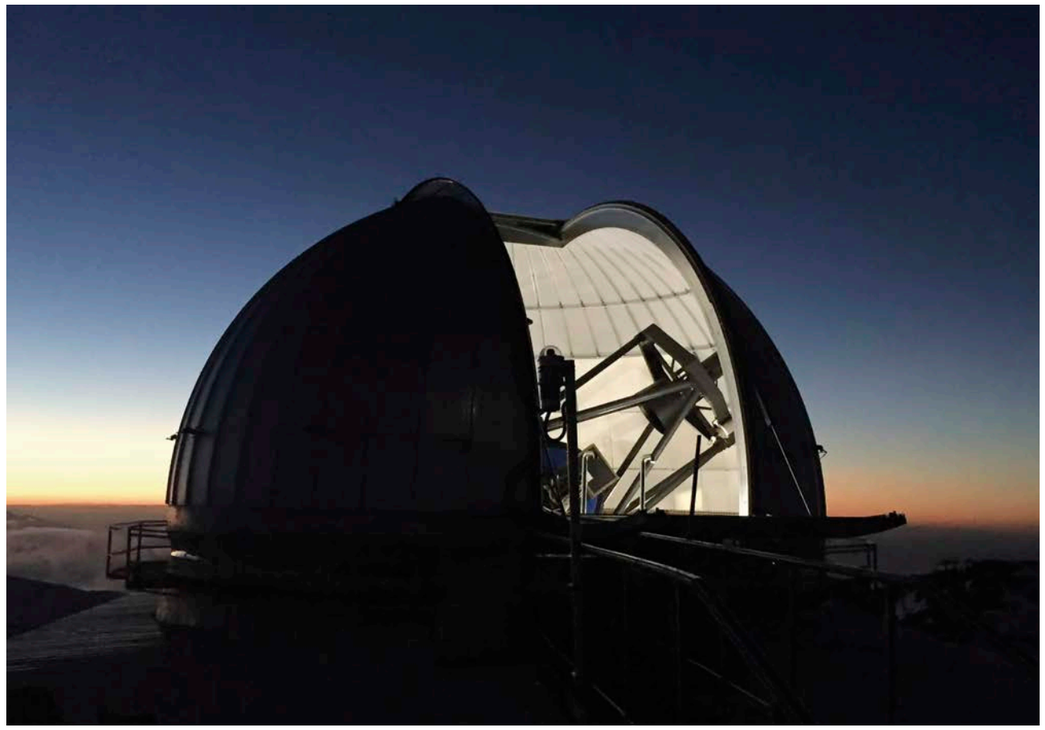
Highlights

Nowadays, small to medium size telescopes are increasingly dedicated to follow-up programs needing an extended time baseline and to observations requiring a prompt response (Target of Opportunity programs, ToO) and good time coverage, and the OSN is not an exception. Among the programs carried in 2020 we highlight:

Follow-up photometry of CARMENES M dwarf targets, with both T90 and T150, to characterize their activity and discard false planet positives by the *Physics of low-mass stars, exoplanets and associated instrumentation* group. Three papers were published with the discovery of three planets and independent confirmation of two planetary systems. The three discovered exoplanets correspond to two temperate-to-warm super-Earths and a super-Earth around a binary star ([241], [87] and [242]). The same group also monitored the **Coma Berenices stellar cluster** and, after identifying misclassified giant stars in it, the new cleared sample supports an age of ~600 Myr, rather than ~800 Myr as been proposed in previous literature [44].

The long term observations and study of the **rotational variability and physical properties of transneptunian objects (TNOs) and Centaurs** through occultations, a program developed by the *Planets and Minor Bodies of the Solar System* group, resulted in the characterization of the large TNO 2002 TC302 from combined stellar occultation, photometry, and astrometry data using T150 observations [187].

A study of the gravity waves activity detected in the mesosphere/lower thermosphere (MLT) was realised using airglow observations performed by the *Spectral Airglow Temperature Imager* (SATI) from 1998 to 2015. The gravity wave activity content exhibits an annual variability with a maximum during winter. Gravity waves with periods of less than 3h are more prevalent than those with longer periods throughout the year. The analysis showed that the gravity waves activity surpassed that of the semidiurnal tides, although it was still smaller than the planetary wave activity, especially in summer when the planetary waves appear to dominate the dynamics of the MLT region [150].



Several ToO programs were running, for the follow-up of Gamma Ray burts by the *HETH* and the *ARAE* groups, as well as for *Stellar occultations by dwarf planets, transneptunian objects (TNOs), and centaurs.*

The OSN also performed observations related to **educational activities**, such as observing practices of the Master in Astronomy and Astrophysics organized by the Valencia International University.

Although guided visits for the general public are traditionally organized in the summer months at OSN with great success, they had to be suspended in 2020 due to security reasons relating to the pandemic situation.

The **IAA Sky Quality Office**, who works to preserve the sky quality in Andalucía, used its several instruments located at the OSN to continuously monitor the sky brightness in different filters providing the acquired data to the *Red Española de Estudios sobre Contaminación Lumínica* (REECL).

Satellite image of the city of Granada and the metropolitan belt. The IAA leads the study on the influence of the state of alarm in 2020 on light pollution levels.

Public Outreach

The activities of the IAA-CSIC Communication, Education and Public Outreach Unit cover almost all existing formats to communicate science.

Popular Science Journal IAA: Información y Actualidad Astronómica. Issued once every four months, it is devoted to high school and university students, as well as general public interested in astronomy. Issues in 2020: 60, 61, 62. **VIEW→**

Lucas Lara popular talks These conferences began in 1995. We celebrate nine talks every year. **VIEW→**

El Radioscopio, a weekly popular science radio program in collaboration with Canal Sur Radio and broadcasted by Radio Andalucía Información. **VIEW→**

The European Researchers' Night takes place every year all over Europe the last Friday of September. The IAA-CSIC took part in the event in Granada on Friday 25. Due to COVID-19 restrictions, the activities were mostly online: 10 talks for the general public, two talks for students, participation in live online programming and participation in the Canal Sur television programme. **VIEW→**

Alicia Pelegrina, Head of Severo Ochoa Office-IAA Support Office, was awarded second prize at the "Famelab 2020" scientific monologue festival. **VIEW→**

Participation in cultural festivals in the city of Granada such as **GranadaHenge, Gravite** and **Chavea**.

PIIISA Project & Granatensis Mission: A multidisciplinary project designed to allow high school students work with scientists. The IAA-CSIC is the founder of the project (suspended due to COVID-19 health crisis) **VIEW→**

"El enigma Agustina", science documentary. Presentation, shows and selection in festivals. **VIEW→**

PRE-EST project *(European Solar Telescope)*. Communication support and recording of the documentary "Reaching for the Sun" (in production). **VIEW→**

11 February, **International Day of Woman and Girls in Science** and 8 March, **International Day of Woman**: Different informal meetings with Women Researchers, engineers and technicians at the IAA were held for the educational centres in Granada with the aim of highlighting the role of women in the different branches of science and Cineforum *El enigma Agustina*, with Carmen Magallón Puertolés and Cristina Prieto Sánchez (UMA) **VIEW→**

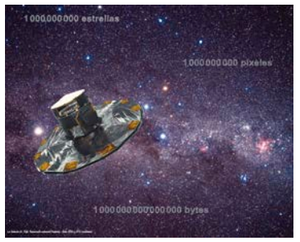
Dissemination of **different outreach resources on television** channels such as La 2, Canal 22 (Mexico) or platforms such as *#cienciadesdecasa* (Fundación Descubre).

Weekly collaboration in the Radio 3 programme **Hoy Empieza Todo** (Daniel Guirado).

El camino de los planetas. A project whose objective is to promote research and planetary exploration among the citizens of Granada. It has included activities, the development of tactile models of celestial bodies and two publicity campaigns in the streets. **VIEW→**

Jupiter-Saturn planetary conjunction. Outreach activities related to the alignment of Jupiter and Saturn. Remote observation broadcast live on our youtube channel. It currently has about 35.000 views. **VIEW→**

Pilares e incertidumbres. IAA-CSIC audiovisual project in which we talk about what we do not know about the universe. **VIEW→**



Mil millones de ojos para mil millones de estrellas. Exhibition on the Gaia mission. Collaboration. **VIEW→**

Calar Alto Observatory Communication. The IAA-CSIC *Communication, Education and Public Outreach* Unit is in charge of the communication of the Observatory.

GRANADA CIENCIA E INNOVACIÓN

Participation in **Granada: ciudad de la Ciencia y la Innovación**, a FECYT funded project of the largest institutions in Granada to bring science and knowledge closer to citizens.

Marte. La conquista de un sueño. Exhibition on Mars. Collaboration with Ciutat de les Arts i Ciences, Fundació Telefónica and Generalitat Valenciana. **VIEW→**

Astronomía Accesible. This project aims at emphasizing the popularization of astronomy among blind and low-vision people. **VIEW→**

Social Networks. Twitter, facebook, youtube and Instagram profiles managing.

https://twitter.com/iaaucc
https://www.facebook.com/iaa.comunicacion
https://www.youtube.com/user/iaaudc
https://www.instagram.com/iaa_csic

VOLVER AL ÍNDICE →

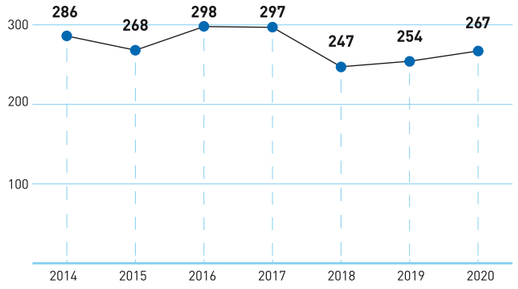
Publications

The research activity carried out at the IAA-CSIC during 2020 can be measured by the number of publications in scientific journals included in the *Science Citation Index* (SCI), i.e., international journals recognized by their quality and impact. In 2020, this activity resulted in **267 papers published** in journals of the SCI.

The complete list of the IAA-CSIC publications in 2020 is given in the Annex at the end of this report. The evolution of the number of SCI publications since 2014 is shown below. Along the years, the number of publications fluctuates around an average value of 270 papers per year.

The publications of the IAA-CSIC are mostly distributed in high impact journals. About 91% of our publications appeared in journals of the first quartile (top 25% journals, or Q1). Among these publications, 14% appeared in the first decile (top 10% journals, or D1). Most of the IAA-CSIC scientific results are published in ***Astronomy & Astrophysics*** and ***Monthly Notices of the Royal Astronomical Society***, the main European astronomical journals. A significant fraction of our results is published in ***Astrophysical Journal***, the most important American astronomical journal.

Another aspect of the scientific research of the IAA and its quantitative results is the leadership of these publications. **About 16% of the IAA SCI 2020 publications are led by IAA scientists**, i.e. their first author belongs to the IAA. This is consistent with the leadership of the IAA in the last 5 years.



IAA publications in SCI journals

Number of publications by journal

93 Astronomy and Astrophysics

63 Monthly Notices of the Royal Astronomical Society

34 Astrophysical Journal

6 Geophysical Research Letters

5 Astrophysical Journal Supplement Series

Journal of Geophysical Research D: Atmospheres

4 Nature Astronomy

3 Astrophysical Journal Letters

Physical Review D - Particles, Fields, Gravitation and Cosmology

2 Advances in Space Research
Astronomical Journal
Atmospheric Measurement Techniques
Frontiers in Astronomy and Space Sciences
Galaxies
Icarus
Journal of Geophysical Research A: Space Physics
Journal of Quantitative Spectroscopy and Radiative Transfer
Planetary and Space Science
Space Science Reviews

1 Others

Workshops & meetings

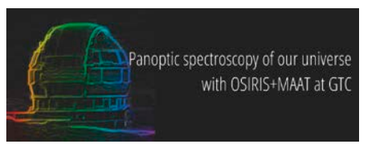
Meetings

Public Surveys and new instrumentation for Calar Alto Observatory →

INTERNATIONAL WORKSHOP
Granada, March 12th-13th, 2020 *(In person & virtual)*
IAA MEMBERS OF THE SOC:
J. Iglesias, I. Márquez, J. Aceituno
IAA MEMBERS OF THE LOC:
J. Iglesias, C. Kehrig, C. Rodríguez, A., Arroyo

Astronomical Data Analysis Software and Systems →

INTERNATIONAL MEETING
Granada, Nov 8th-12th, 2020 *(Virtual Format)*
IAA MEMBERS OF THE SOC: J. Ruiz del Mazo
IAA MEMBERS OF THE LOC: J. Ruiz del Mazo



Panoptic spectroscopy of our universe with OSIRIS+MAAT at GTC →

INTERNATIONAL MEETING
Granada May 5th, 2020 *(Virtual Format)*

Schools

Open Science Droplets
Granada, Feb. 25th-29th, 2020
https://droplets-spsrc.readthedocs.io

Course on gender analysis in research
Granada, June 25th-July 24th, 2020
(Virtual Format)
https://www.iaa.csic.es/meetings/course-gender-analysis-research

Introductory course to astronomy and astrophysics
Granada, July 1st-17th, 2020
https://www-divulgacion.iaa.es/meetings/introductory-course-astronomy-and-astrophysics

Scientific writing and presentation in Astronomy
Granada, Sep. 16th-17th, 2020
(Virtual Format)
https://forms.gle/EcLmmMHW93LiPMyN9

El cielo oscuro como recurso científico, cultural, medioambiental y turístico
Sevilla, Oct. 6th-9th, 2020
(Virtual Format)
IAA MEMBERS OF THE ORGANIZING COMMITEE:
J. Vílchez Medina, A. Pelegrina López
https://www.iaa.csic.es/meetings/el-cielo-oscuro-como-recurso-cientifico-cultural-medioambiental-y-turistico

SOMACHINE Machine Learning, Big Data, and Deep Learning in Astronomy
IAA-CSIC, Nov. 23th-27th, 2020
IAA MEMBERS OF THE ORGANIZING COMMITEE: R. Schoedel
IAA MEMBERS OF THE LOCAL ORGANIZING COMMITEE:
A. Pelegrina López, M. González García
https://www.granadacongresos.com/somachine2020

VOLVER AL ÍNDICE →

Gender actions

Institute's Gender Equality Commission in 2020.

Overview

The IAA has been characterized by its support of inclusive initiatives in Gender Equality. This trajectory has crystallized in the creation of the **Institute's Gender Equality Commission** and the elaboration and approval of the First Gender Equality Plan of the IAA-CSIC (GEP), in 2017. Here we present the gender diagnostic and main activities for the year 2020.

During the year 2020, the Equality Commission continued its work of advising on the necessary or appropriate measures to actively integrate the principle of gender equality between women and men in the daily life of the centre, as well as organizing events to raise awareness of the role of women in science. In October 2020, some of its members were renewed.

Highlights

In addition to ensuring the gender equality measure, the Gender Equality Commission of the IAA-CSIC acts as the ***Gender Working Group*** of the gender equality plan drawn up by the Severo Ochoa project. All their governance bodies verify the gender equality, and the following actions have been contemplated:

1) ***Hypatia of Alexandria Visiting Grant:*** 3 visits of the visiting researchers programme, out of the 9 offered, were given by female researches.

2) ***Vera Rubin Colloquium***: A minimum of 9 colloquia, out of the 17 offered, were given by female researchers.

Gender Activities in 2020 in the center

- Production of the annual statistics segregated by gender.

- Organization of **activities for the International Day of Women and Girls in Science** (11 February). Different informal meetings with Women Researchers, engineers and technicians at the IAA were held for the educational centers in Granada with the aim of highlighting the role of women in the different branches of science and included open discussion, reflection and questions about gender roles
and the existing stereotype around science, technology and engineering.

From the IAA we count with the participation of the researchers: Rocío Ortega Calvo, Cristina Rodríguez López, Mayra Osorio, Ascensión del Olmo, Carmen Pastor, Olga Muñoz and Laura Hermosa as well as students from 3rd course of ESO of IES Jiménez de Quesada of Santa Fé and IES Severo Ochoa de Granada and 20 pupils of CEIP Abencerrajes (11-12 years old).

- Organization of **activities for the International Women's Day** (March 8): Two open activities were organised: *Feminism in STEM areas*, with the participation of Maria Jose Cáceres (UGR) Evangelina Santos Aláez (UGR) and Carmen Magallón Puertolés (Fundación Seminario de Investigación para la Paz) and the Cineforum *El enigma Agustina*, with Carmen Magallón Puertolés and Cristina Prieto Sánchez (UMA).

Alicia Pelegrina, 2nd prize at Famelab 2020.

Online course Inclusion of Gender Analysis in Research and Innovation

- **Outreach activities:** Lecture for students about *Women and Astronomy* by Sara Cazzoli (IAA) at the GRAVITE festival. Five online lectures by women researchers from the IAA at the European Researchers' Night 2020. Alicia Pelegrina, Head of Severo Ochoa Office-IAA Support Office, was awarded with the second prize at the *Famelab 2020* scientific monologue festival.

The librarian of the IAA-CSIC disseminate in open access the activities on gender developed in the IAA (equality plans, articles, IAA magazine, material of spreading, and any other activity carried out in the IAA). All the materials are located in the Institutional Repository CSIC, guaranteeing in this way their preservation in the long term.

We continued to collaborate with scientific outreach magazines and the newspapers El País, Granada Hoy and Ideal. In the IAA magazine *Información y Actualidad Astronómica*, several articles were published with the aim of making visible female scientists who have contributed significantly to the development of astronomy.

- **Gender equality course:** In June and July 2020 the online course *Inclusion of Gender Analysis in Research and Innovation* took place. This course was led by Capitolina Díaz, Professor of Sociology at the University of Valencia. This course was aimed at improving the competences of research staff and doctoral students in the inclusion of the gender perspective both in projects and doctoral thesis work as well as in research projects and scientific articles. About 20 people attended (60% women, 40% men). The response to the course by the students was highly satisfactory.

- ***Gender Equality and COVID-19*** **Questionnaire**: An online evaluation survey was launched on 22 October among IAA-CSIC members to collect data on the impact of the COVID-19 health crisis actions taken at work. The results were published in March 2021.

- **CSIC Gender Equality Commisions Meeting:** In November, we participated in the first meeting of the CSIC Gender-Equality Commissions. The conference, developed in the framework of the European project LeTSGEPs, was organised by the ICM-CSIC in coordination with the CSIC Gender Equality Commission. The IAA-CSIC Gender Equality Commission presented its activities and then several of its members participated in group discussions.

- **IAA-CSIC Activities Gender Impact Report:** During the last months of 2020, the IAA Gender Equality Commission worked on the elaboration of a short gender impact report that all activities (courses, congresses, meetings, dissemination activities, etc) with the participation of the IAA_CSIC, either as organiser or co-organiser, must fill out to assess the level of compliance with the IAA-CSIC Gender Equality Plan.

Awards

In 2020, the IAA-CSIC was awarded with the **Medalla de Andalucía**, an honorary distinction granted by the Junta de Andalucía in recognition of extraordinary actions, services and merits, in the category of Research, Science and Health.

On the fortieth anniversary of the constitution of Andalusia as an autonomous community, the forty-five years of work of the Instituto de Astrofísica de Andalucía are recognised, which have culminated in a privileged position in the international environment, both in astrophysics research and in technological development for space, and in the distinction as a Severo Ochoa Centre of Excellence. This Medal is an honour for all of us, which gives us a new dose of enthusiasm and determination to continue developing top-level science and technology, said Antxon Alberdi, director of the IAA-CSIC.

In addition, the researchers José Luis Gómez and Antxon Alberdi was awarded with the *Bandera de Granada* for their participation in obtaining the first image of a black hole with the *Event Horizon Telescope* (EHT). The award, which recognises exceptional work at the provincial level, has gone to the group of engineers and scientists participating in the EHT consortium from the IAA and the IRAM observatory at Pico Veleta (Sierra Nevada).

IAA
Medalla de Andalucía 2020
(+ Bandera de Andalucía de Granada 2020)

Concepción Cárdenas
MERAC Award 2020,
Best PHD in New Technologies

EHT Collaboration
(José Luis Gómez – GuangYao Zhang-Rocco Lico -Antxon Alberdi)
2020 Einstein Medal
and ***2020 Bruno Rossi Prize***

A. Alberdi / J.L. Gómez
Premio RSEF 2020
Mejor Artículo de Divulgación en las publicaciones de la RSEF

Silbia López de Lacalle
Premio Prismas 2020
Mejor "Texto inédito" por su libro
Expedición al volcán de sal

Alicia Pelegrina
2nd Prize Famelab Spain 2020

Funding

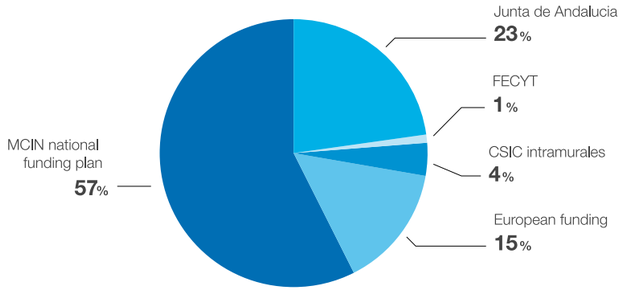
IAA obtains most of its funding through competitive European and Spanish grants.

During 2020, IAA had a total budget of **14,2 million €**, from which **7,3 million €** (52%) come from competitive projects and CSIC investments; the other **6,8 million €** (48%) corresponds to the permanent staff total cost and common expenses.

The yearly evolution of the IAA budget in the last 5 years is shown below, including the different concepts.

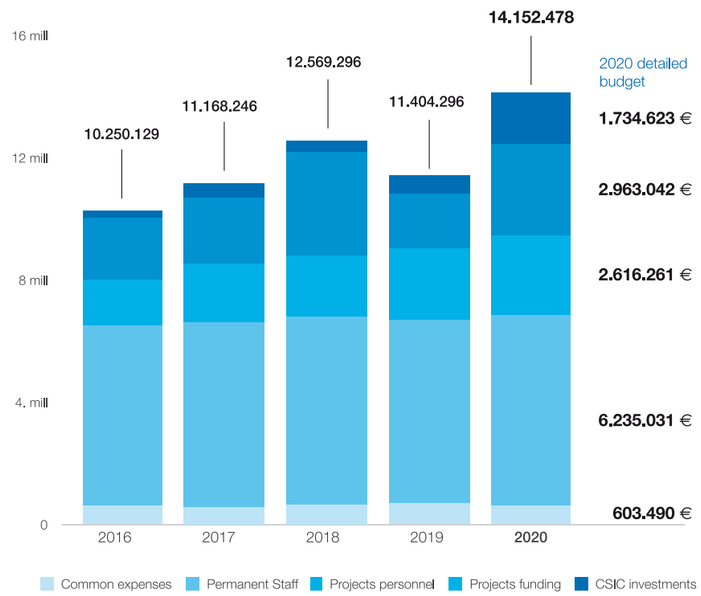
IAA 2020 competitive fundings

Total:
7,3 million €

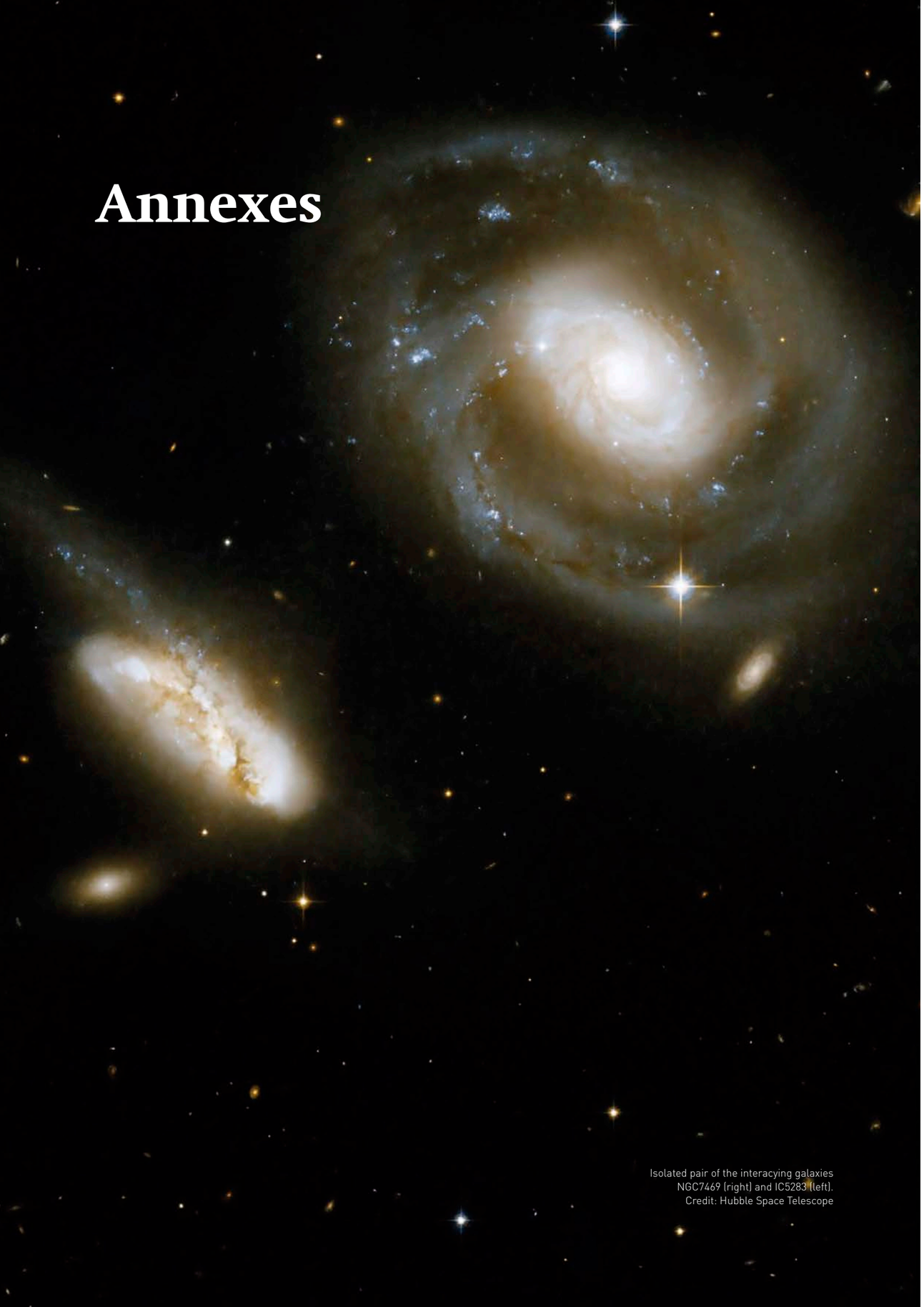


IAA budget yearly evolution

Total 2020:
14,2 million €



Annexes



Isolated pair of the interacying galaxies NGC7469 (right) and IC5283 (left). Credit: Hubble Space Telescope

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Staff

Assigned research group

[1] Solar Physics
[2] Planets and minor bodies
[3] Terrestrial atmosphere
[4] Low-mass stars
[5] Stellar variability
[6] ARAE
[7] HETH
[8] Stellar systems
[9] Physics of the interstellar medium
[10] AGN jets
[11] Galaxy evolution
[12] Theoretical gravitation and cosmology
[13] Observational cosmology
[14] Cosmology and particle physics

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Moreno Danvila, Fernando [2]
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Juan de la Cierva Postdocs

Jones, Michael Gordon [11]

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González Galindo, Francisco [3]
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Casanova Escurín, Víctor Manuel
de la Rosa Alvarez, José Luis
Mirasol Junco, José Alberto
Pérez Silvente, Tomás
Ruiz Bueno, José Antonio
Sánchez Funes, Fernando
Sota Ballano, Alfredo

SERVICES & ADMINISTRATION

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Parra Garófano, Rafael

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Molina Rodrigo, Antonio
Rendón Martos, Francisco

Library

Arco Sarmiento, María Ángeles

Outreach and communication

García Gómez-Caro, Emilio José
López de la Calle Ramos, Silbia

Ongoing projects

AGENCIA ESTATAL DE INVESTIGACIÓN

Title: **Apoyo a Centros de Excelencia Severo Ochoa**
Ref.: SEV-2017-0709
PI: Isabel Márquez Pérez
Dur.: Jul 01, 2018 - Jun 30, 2022

Title: **Modelo de repuesto y de vuelo de subsistemas de JANUS y GALA. Formacion y evolucion de sistemas planetarios: desde cuerpos menores a exoplanetas**
Ref.: PGC2018-099425-B-I00
PI: Luisa María Lara López
Dur.: Jan 01, 2019 - Sep 30, 2022

Title: **Participacion del IAA-CSIC en la mision espacial PLATO2.0. Fases c/d-1. Operacion NOMAD-EXOMARS**
Ref.: PID2019-107061GB-C63
PI: Rafael Garrido Haba, Julio Federico Rodríguez Gómez
Dur.: Jun 01, 2020 - May 31, 2024

Title: **Física solar espacial**
Ref.: RTI2018-096886-B-C51
PI: Jose Carlos del Toro Iniesta, David Orozco Suárez
Dur.: Jan 01, 2019 - Dec 31, 2021

Title: **Agujeros negros supermasivos y jets relativistas**
Ref.: PID2019-108995GB-C21
PI: José Luis Gómez Fernández
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Detección y caracterización de los sistemas planetarios en estrellas enanas M: Entendiendo su estrella y sus planetas**
Ref.: PID2019-109522GB-C52
PI: Pedro José Amado González
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Atmosfera y clima de la tierra y exo-planetas**
Ref.: PID2019-110689RB-I00
PI: Bernd Rainer Funke, Manuel López Puertas
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Contribucion del IAA a la explotacion cientifica de ASIM: Experimentos, observaciones desde suelo, análisis de datos y modelización**
Ref.: PID2019-109269RB-C43
PI: Francisco José Gordillo Vázquez
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Comprension de la actividad nuclear en galaxias: de las bajas a las altas tasas de acrecion**
Ref.: PID2019-106027GB-C41
PI: Isabel Márquez Pérez, Ascensión del Olmo Orozco
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Galaxias en 3D y sus propiedades integradas: sinergia entre J-PAS/J-PLUS e IFS**
Ref.: PID2019-109067GB-I00
PI: Rosa María González Delgado
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Estallidos de formacion estelar a lo largo de la evolucion el universo**
Ref.: PID2019-107408GB-C44
PI: José Manuel Vílchez Medina, Jorge Iglesias Páramo
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Astronomia de rayos gamma con MAGIC y CTA-NORTE - contribucion del IAA-CSIC**
Ref.: PID2019-107847RB-C44
PI: Juan Iván Agudo Rodríguez
Dur.: Jun 01, 2020 - May 31, 2023

Title: **Caracterizacion de la atmosfera de marte con los instrumentos NOMAD y ACS a bordo de TGO/EXOMARS**
Ref.: PGC2018-101836-B-I00
PI: Miguel Angel López Valverde
Dur.: Jan 01, 2019 - Sep 30, 2022

Title: **AMIGA7: Gas y campos magneticos en entornos extremos de galaxias con los precursores de SKA - desde el diseño del flujo de datos hacia su construccion**
Ref.: RTI2018-096228-B-C31
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Jan 01, 2019 - Dec 31, 2022

Title: **Los galaticos de la galaxia: Estrellas masivas, cumulos estelares y el centro galactico**
Ref.: PGC2018-095049-B-C21
PI: Rainer Schoedel, Emilio Javier Alfaro Navarro
Dur.: Jan 01, 2019 - Dec 31, 2022

Title: **GRBphot - Base de datos fotométricos de explosiones de rayos gamma**
Ref.: RTI2018-098104-J-I00
PI: David Alexander Kann
Dur.: Sep 01, 2019 - Aug 31, 2022

Title: **Legado del proyecto**
Ref.: RTI2018-098657-J-I00
PI: Pablo Santos Sanz
Dur.: Jan 01, 2019 - Aug 31, 2022

Title: **Cielos y universos para los grandes cartografiados de galaxias: Explotacion cientifica**
Ref.: PGC2018-101931-B-I00
PI: Francisco Prada Martínez
Dur.: Jan 01, 2019 - Dec 31, 2021

Title: **Experimentos de laboratorio, observaciones y modelos de polvo cometario: Una nueva estrategia**
Ref.: RTI2018-095330-B-I00
PI: Olga Muñoz Gómez, Juan Carlos Gómez Martín
Dur.: Jan 01, 2019 - Dec 31, 2021

Title: **Física oculta en la evolución en tiempo real de las nebulosas gaseosas en torno a estrellas evolucionadas de masa baja e intermedia**
Ref.: PGC2018-102184-B-I00
PI: Martín Guerrero Roncel
Dur.: Jan 01, 2019 - Dec 31, 2022

Title: **Red tematica para la participacion cientifica y tecnologica española en el SKA**
Ref.: RED2018-102587-T
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Jan 01, 2020 - Dec 31, 2021

Title: **SISTEMA DE OBSERVACIÓN DE LA MITAD DE LA BÓVEDA CELESTE EN LA NUEVA ERA DE ASTROFÍSICA DE MULTIMENSAJEROS**
Ref.: EQC2018-004735-P
PI: Alberto Javier Castro Tirado
Dur.: Jan 01, 2018 - Mar 31, 2021

Title: **Contribucion del IAA-CSIC a la mision espacial PLATO2.0: fases B2/C/D. operacion de NOMAD-EXOMARS**

Ref.: ESP2017-87676-C5-5-R
PI: Rafael Garrido Haba, Julio Federico Rodríguez Gómez
Dur.: Jan 01, 2018 - Dec 31, 2020

Title: **Estructura, procesos y clima de las atmosferas de la tierra y exoplanetas**

Ref.: ESP2017-87143-R
PI: Bernd Rainer Funke, Manuel López Puertas
Dur.: Jan 01, 2018 - Dec 31, 2020

Title: **Jets estelares, discos y campos magneticos. ciencia para el SKA y contribucion al diseño de PHASED ARRAY FEEDS**

Ref.: AYA2017-84390-C2-1-R
PI: Guillem Josep Anglada i Pons, José Francisco Gómez Rivero
Dur.: Jan 01, 2018 - Sep 30, 2021

Title: **Contribución del IAA a la explotación científica de ASIM: Observaciones desde el suelo y análisis de datos**

Ref.: ESP2017-86263-C4-4-R
PI: Francisco José Gordillo Vázquez
Dur.: Jan 01, 2018 - Dec 31, 2020

Title: **Estudio de objetos transneptunianos y poblaciones relacionadas**

Ref.: AYA2017-89637-R
PI: José Luis Ortiz Moreno
Dur.: Jan 01, 2018 - Dec 31, 2020

Title: **Telescopio extremadamente ligero**

Ref.: EQC2018-004455-P
PI: José Luis Ortiz Moreno
Dur.: Jan 01, 2018 - Mar 31, 2021

Title: **En camino hacia SKA: Astronomia a la más alta resolución angular y sensibilidad**

Ref.: PGC2018-098915-B-C21
PI: Miguel Angel Pérez Torres, Antonio María Alberdi Odriozola
Dur.: Jan 01, 2019 - Jun 30, 2021

Title: **AGN, del universo local a distancias cosmologicas. del motor central a la galaxia anfitriona y su entorno**

Ref.: AYA2016-76682C3-1-P
PI: Isabel Márquez Pérez
Dur.: Dec 30, 2016 - Mar 29, 2021

Title: **Universo y vacio cuanticos**

Ref.: FIS2017-86497-C2-1-P
PI: Carlos Barceló Serón
Dur.: Jan 01, 2018 - Sep 30, 2021

Title: **Equipamiento computacional para desarrollar el núcleo de un Prototipo de SKA Science Regional Centre en el IAA**

Ref.: EQC2019-005707-P
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Jan 01, 2019 - Dec 31, 2020

Title: **Adquisición de una nueva infraestructura de gran capacidad de memoria RAM y almacenamiento para la creación de cielos digitales**

Ref.: EQC2019-006089-P
PI: Francisco Prada Martínez
Dur.: Jan 01, 2019 - Dec 31, 2020

Title: **Caracterización polarimétrica bidimensional del frente de onda en cristales ópticos**

Ref.: EQC2018-004400-P
PI: David Orozco Suárez
Dur.: Jan 10, 2018 - Dec 31, 2020

Title: **Entendiendo la estructura interna, la evolución y la variabilidad de estrellas de baja masa con planetas**

Ref.: AYA2016-79425-C3-3-P
PI: Matilde Fernández Hernández
Dur.: Dec 30, 2016 - Dec 29, 2020

Title: **Galaxias en 3D a través del universo: Sinergia entre espectroscopia de campo integral y cartografiados multibanda panorámicos**

Ref.: AYA2016-77846-P
PI: Rosa María González Delgado, Enrique Pérez Jiménez
Dur.: Dec 30, 2016 - Dec 29, 2020

Title: **Estallidos de formación estelar y evolución de galaxias**

Ref.: AYA2016-79724-C4-4-P
PI: José Manuel Vílchez Medina, Enrique Pérez Montero
Dur.: Dec 30, 2016 - Dec 29, 2020

Title: **Jets relativistas en galaxias activas**

Ref.: AYA2016-8089-P
PI: José Luis Gómez Fernández, Juan Iván Agudo Rodríguez
Dur.: Dec 30, 2016 - Dec 29, 2020

Title: **Photometric REDSHIFTS para J-PAS**

Ref.: AYA2016-81065-C2-1-P
PI: Narciso Benítez Lozano
Dur.: Dec 30, 2016 - Dec 29, 2020

MICINN/MINECO

Title: **AMIGA6: Gas en el interior y en el entorno de las galaxias. preparación científica para SKA y contribución al diseño del flujo de datos**

Ref.: AYA2015-65973-C3-1-R
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Jan 01, 2016 - Jun 30, 2020

Title: **Coordinación de la participación científica y tecnológica de España en el Square Kilometre Array. Oficina española del SKA.**

Ref.: 201950E125
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Dec 01, 2019 - Nov 30, 2022

EUROPEAN PROGRAM FUNDS

Title: **e-LIGHTING: Lightning propagation and high-energy emissions within coupled multi-model simulations**

Ref.: 681257 (ERC-2015-COG)
PI: Alejandro Luque Estepa
Dur.: Jun 01, 2016 - May 31, 2021

Title: **Preparatory Phase for the European Solar Telescope (PRE-EST)**

Ref.: 739500 H2020-INFRA/0287
PI: Luis Ramón Bellot Rubio
Dur.: Apr 01, 2017 - Dec 31, 2021

Title: **Science and Innovation with thunderstorms (SAINT)- H2020-MSCA-ITN-2016**

Ref.: H2020-MSCA-ITN-2016
PI: Francisco José Gordillo Vázquez
Dur.: Mar 01, 2017 - Feb 28, 2021

Title: **ROle and impAct of Dust and clouds in the Martian Atmosphere: from lab to space (ROADMAP)**

Ref.: 01004052 H2020-LEIT-SPACE/0753
PI: Olga Muñoz Gómez
Dur.: Nov 01, 2020 - Oct 31, 2023

Title: **CICLE - Unveiling the formation and evolution of galaxy clusters through the intracluster light and multidisciplinar techniques of image** processing and big data analysis

Ref.: H2020-MSCA-IF-2019 -- 898633
PI: Yolanda Jiménez Teja
Dur.: Apr 01, 2020 - Mar 31, 2022

Title: **SOLARNET - 824135- Integrating High Resolution Solar Physics - H2020**

Ref.: 824135
PI: Luis Ramón Bellot Rubio
Dur.: Jan 01, 2019 - Dec 31, 2022

Title: **ESCAPE-European Science Cluster of Astronomy & Particle physics ESFRI research infrastructures**

Ref.: 824064 - H2020-INFRA/0489
PI: Lourdes Verdes-Montenegro Atalaya
Dur.: Feb 01, 2019 - Jul 31, 2022

Title: **Optical Infrared Coordination Network for Astronomy (OPTICON)**

Ref.: 730890 - H2020-INFRA/0243
PI: José Manuel Vílchez Medina
Dur.: Jan 01, 2017 - Dec 31, 2020

REGIONAL GOVERNMENT JUNTA DE ANDALUCíA

Title: **Acciones para el fortalecimiento del IAA-CSIC para la adquisición del sello "Severo Ochoa"**

Ref.: SOMM17/5208/IAA
PI: Antonio María Alberdi Odriozola
Dur.: Jan 01, 2019 - Feb 28, 2022

Title: **Stellar Tidal Streams in the Local Universe as Cosmological Diagnostic**

Ref.: TASE-136
PI: David Martinez Delgado
Dur.: Oct 01, 2020 - Sep 30, 2023

Title: **LUCA: Revelando la estructura fina de las**

Ref.: P18-FRJ-2595
PI: Rosa María González Delgado, Enrique Pérez Jiménez, Ginés Martínez Solaeche
Dur.: Dec 01, 2020 - Nov 30, 2023

Title: **Supermassive black holes and blazar jets**
Ref.: P18-FR-1769
PI: José Luis Gómez Fernández
Dur.: Jan 01, 2020 - Jun 30, 2023

Title: **Propiedades físicas del polvo cometario y aplicaciones biomédicas**
Ref.: P18-RT-1854
PI: Fernando Moreno Danvila, Olga Muñoz Gómez
Dur.: Jan 01, 2020 - Dec 31, 2022

Title: **IAA4SKA. Contribution of the Instituto de Astrofísica de Andalucía to the Square Kilometre Array (SKA): Open Science and Engineering to reinforce the leadership of the Spanish participation in the SKA.**
Ref.: P18-RT-3082
PI: Lourdes Verdes-Montenegro Atalaya, Antonio María Alberdi Odriozola
Dur.: Jan 01, 2020 - Dec 31, 2022

Title: **Estudiando galaxias jóvenes con tecnología de vanguardia: piezas clave de la evolución del Universo**
Ref.: P18-FR-2664
PI: Jorge Iglesias Páramo
Dur.: Jan 01, 2020 - Dec 31, 2022

Title: **Excelencia científica y tecnológica en el IAA-CSIC: OSN, UDIT y Centro de Cálculo**
Ref.: IE19_242_C SIC-I AA
PI: Antonio María Alberdi Odriozola
Dur.: Dec 28, 2020 - Dec 27, 2022

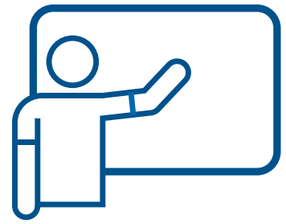
Title: **Acciones para la optimización de observatorios astronómicos en Andalucía**
Ref.: IE-2017-5298
PI: Antonio María Alberdi Odriozola
Dur.: May 01, 2020 - Apr 30, 2022

FECYT

Title: **Incursiones gravitatorias**
Ref.: FCT-18-13451
PI: Carlos Barceló Serón, Emilio José García Gómez-Caro, Silbia López de la Calle Ramos, Manuel Jesús González García
Dur.: Apr 01, 2019 - Dec 31, 2020

Title: **Granada, el camino hacia los planetas**
Ref.: FCT-18-13740
PI: Luisa María Lara López
Dur.: Oct 01, 2019 - Dec 31, 2020

Education & teaching



PhD, Master and Degree theses

Title: **Physical and chemical properties of galaxies with star formation in different environment**
Level: PhD
Author: Salvador Duarte Puertas
Sup.: Jose Manuel Vilchez and J. Iglesias Páramo
Univ.: Universidad de Granada
Date: 20 January 2020

Title: **Estudio de las abundancias químicas en galaxias con núcleos activos del cartografiado CALIFA**
Level: Master
Author: Jesús Javier González Padilla
Sup.: Enrique Pérez Montero & Rubén García Benito
Univ.: Universidad Internacional de Valencia (VIU)
Date: 07 April 2020

Title: **Normalized Cumulative Rank distributions of supernova environments from J-PLUS**
Level: Máster
Author: Raúl González Díaz
Sup.: Lluís Galbany (UGR) & Rubén García Benito (IAA)
Univ.: Universidad de Granada
Date: July 2020

Title: **Caracterización de atmósferas de exoplanetas con espectroscopía de alta resolución**
Level: Master
Author: Francisco José García Izquierdo
Sup.: Manuel López Puertas
Univ.: Universidad de Granada
Date: July 2020

Title: **A Combined Mid-to-Near Infrared Study of the Stellar Population in the Galactic Centre**
Level: Master
Author: Miguel Cano González
Sup.: Rainer Schoedel (IAA) and Francisco Nogueras Lara (MPIA, Germany)
Univ.: Universidad de Granada
Date: 17 September 2020

Title: **Variability of Nearby Quasars**
Level: Master
Author: Jerusalem Tamirat
Sup.: Mirjana Povic
Univ.: Ethiopian Space Science and Technology Institute, in collaboration with Addis Ababa Univ., Ethiopia
Date: October 2020

Title: **Global data transfer survey for SKA Interferometer data processing nodes**
Level: Master
Author: Álvaro Mesa Suárez
Sup.: Julián Garrido, Javier Moldón
Univ.: Universidad de Granada
Date: September 2020

Title: **Chemical abundances in nearby galaxies from the Palomar Survey**
Level: Master
Author: Borja Pérez Díaz
Sup.: Josefa Masegosa Gallego, Isabel Márquez Pérez
Univ.: Universidad de Granada
Date: 15 July 2020

Title: **Criterios para la extracción de frecuencias en curvas de luz de estrellas pulsantes observadas por TESS**

Level: Master
Author: Sergio Álvarez Martínez
Sup.: Javier Pascual Granado, Antonio García Hernández
Univ.: Universidad de Granada
Date: 14 September 2020

Title: **Poblaciones estelares de la corriente de Sagitario con J-PLUS**

Level: Master
Author: Manuel Piñeiro Fiel
Sup.: Martinez Delgado, David
Univ.: Universidad Internacional de Valencia
Date: 25 July 2020

Title: **Fotometría J-PLUS de estrellas variables RR Lyrae: sondeando la estructura de la Vía Láctea**

Level: Master
Author: María Fernanda Serrano Maldonado
Sup.: Martinez Delgado, David
Univ.: Universidad Internacional de Valencia
Date: 25 Junio 2020

Title: **Búsqueda de estudios abiertos y otras sobre-densidades en Canis Major**

Level: Master
Author: Pablo García Zavala
Sup.: Martinez Delgado, David
Univ.: Universidad Internacional de Valencia
Date: 16 Diciembre 2020

Title: **La lista de Whiting: Clasificación de objetos de bajo brillo superficial con los Legacy surveys.**

Level: Master
Author: Pedro Francisco Rodríguez Ramos
Sup.: Martinez Delgado, David
Univ.: Universidad Internacional de Valencia
Date: 16 Diciembre 2020

Title: **Velocity maps and dark matter content of galaxies in voids**

Level: Degree in Physics
Author: Ana Conrado Pérez
Sup.: Isabel Pérez Martín (UGR) & Rubén García Benito (IAA)
Univ.: Universidad de Granada
Date: July 2020

Title: **Atacama Large Millimeter Array observations of proto-planetary disks**

Level: Degree
Author: José Manuel Salas Gabás.
Sup.: Miguel Pérez Torres
Univ.: Universidad de Zaragoza
Date: February 2020

TEACHING

In-house courses

Title: **Scientific writing and presentation in Astronomy**

Teach.: Miguel Ángel Pérez Torres and Rainer Schoedel.
Prog.: Training Prog. of the IAA SO Excellence Prog.
Organizing institution IAA-CSIC
Hours: 6
Date: 16/17 September 2020

Undergraduate, Master and PhD Prog.s

Title: **Introducción a la reducción, estructura y manejo de cubos de datos de Espectroscopía de Campo Integral**

Teach.: Rubén García Benito
Prog.: Seminarios del Máster en Física Teórica de la UAM
Univ.: Universidad Autónoma de Madrid (UAM)
Hours: 2
Date: 12 November 2020

Title: **Estudio de la Variabilidad de Agua en la Mesosfera a partir de Medidas Satelitales**

Supervised internship of Ismael Franco Moya
Teach.: Maia García Comas
Prog.: Master Prog. in Geophysics and Meteorology
Univ.: Universidad de Granada
Hours: 125
Date: 01-03-2021 to 15-06-2021

Title: **Astrobiología y planetas extrasolares**

Teach.: Manuel López Puertas
Prog.: Máster Universitario en Física: Radiaciones, Nanotecnología, Partículas y Astrofísica
Univ.: Universidad de Granada
Hours: 15
Date: April-May 2020

Title: **Técnicas Observacionales en Astrofísica**

Teach.: Martín Guerrero Doncel and Alberto J. Castro-Tirado
Prog.: Master Prog. in Physics and Mathematics- FISyMAT
Univ.: Universidad de Granada
Hours: 10.5
Date: April-June 2020

Title: **Radioastronomía**

Teach.: José Francisco Gómez, Guillem Anglada, Antonio Alberdi, Angela Gardini
Prog.: Master Prog. in Physics and Mathematics- FISyMAT
Univ.: Universidad de Granada
Hours: 60
Date: October 2020- February 2021

Title: **Modern Observational Techniques in Astronomy**

Teach.: Mirjana Povic
Prog.: MSc Prog. in Astronomy and Astrophysics
Univ.: Ethiopian Space Science and Technology Institute, in collaboration with Addis Ababa Univ., Ethiopia
Hours: 60
Dates: March - June 2020 and November 2020 - March 2021

Title: **Stellar interior and evolution and Radiation Measurements in Astrophysics**

Teach.: Mirjana Povic
Prog.: MSc Prog. in Astronomy and Astrophysics
Univ.: Ethiopian Space Science and Technology Institute, in collaboration with Addis Ababa Univ., Ethiopia
Hours: 60
Date: November 2020 - March 2021

Title: **The XXI century radio observatory: the Square Kilometre Array (SKA), within course "Frontier Research in Astrophysics and Particle Physics"**

Teach.: Javier Moldón
Prog.: Máster Inter-Universitario en Física de Partículas y del Cosmos
Univ.: Universidad de Cantabria
Hours: 1
Date: 1 April 2020

Title: **Stars, Nucleosynthesis and Chemical Evolution of Galaxies**

Teach.: Jose M. Vilchez
Prog.: Master in Physics: Radiation, Nanotechnology, Particles and Astrophysics
Univ.: Universidad de Granada
Hours: 10
Date: March-April 2020

Other Programs

Title: **Optical properties of cosmic dust**

Teach.: Daniel Guirado Rodríguez
Prog.: IAA-SO outgoing visits Prog.me
Organizing Institution: Instituto de Radioastronomía y Astrofísica (IRyA) - UNAM
Hours: 12
Date: 2-6 March2020

Title: **Introduction to the world of galaxies**

Teach.: Mirjana Povic
Prog.: MSc/PhD students, African School of Physics (ASP)
Univ.: ASP and the Univ. of Namibia (virtual)
Hours: 4
Date: June, 2020

Title: **The dark sky as a scientific, cultural, environmental and tourist resource.**

Teach.: Alicia Pelegrina, Jose Manuel Vílchez
Prog.: Summer courses of Universidad Internacional de Andalucía
Univ.: Universidad Internacional de Andalucía
Hours : 25
Date: 6-9 October

Title: **Introducción a la astronomía, for people over 55**

Teach.: Miguel Pérez Torres
Prog.: Universidad de la Experiencia de Zaragoza
Univ.: Universidad de Zaragoza
Hours: 20
Date: February 2020

Press releases

Triple planetary conjunction: an ideal opportunity to enjoy the night sky VIEW→

11/12/2020

In December 2020, due to the alignment of the Earth, Jupiter and Saturn, we were able to see the giant planets of the Solar System very close in the sky. Many activities were organized to enjoy the event.

RoadMap: studying the ubiquitous yet poorly known Martian dust VIEW→

10/12/2020

As part of the European Horizon 2020 program, the RoadMap project (Role and impact of dust and clouds in the Martian atmosphere) started in December.

The Stingray nebula, the youngest known, is fading VIEW→

03/12/2020

Observations with the Hubble Space Telescope showed how this young nebula lost its brightness and changed shape in just two decades.

MHONGOOSE begins to study the weak atomic gas that surrounds galaxies, key in their evolution VIEW→

30/11/2020

MHONGOOSE, a legacy project of the MeerKAT radio-interferometer, South African precursor of the Square Kilometer Array, produced its first results. They were obtained in its preparatory phase, thus anticipating the window that will open to the understanding of the formation and evolution of galaxies.

Ariel mission moves from blueprint to reality VIEW→

23/11/2020

The mission, developed by the European Space Agency (ESA) and scheduled for launch in 2029, moved from the study phase to the implementation phase, which involves selecting an industrial contractor to build the spacecraft. The IAA-CSIC participates in Ariel through two of its scientific working groups

Published the new J-PLUS catalog, with almost twenty million celestial objects VIEW→

05/11/2020

The IAA-CSIC participates in the project, coordinated by the Center for the Study of Physics of the Cosmos of Aragon (CEFCA).

Rapid radio bursts detected in our Galaxy VIEW→

04/11/2020

The identification of a source producing very short duration radio bursts in our own galaxy, the Milky Way, was presented in three articles in the journal Nature. Studies suggest that a magnetar, a neutron star with a very intense magnetic field, would be behind this phenomenon.

Confirmed the existence of a new electrical phenomenon in the atmosphere: blue flashes produced by cold electrical discharges VIEW→

23/10/2020

The study, led by researchers from the IAA-CSIC, was possible thanks to data provided by the ASIM space mission of the European Space Agency (ESA).

The Galactic Center: a unique laboratory for the study of black holes VIEW→

23/10/2020

Andrea Ghez, Nobel Prize in Physics 2020, gave an online conference on the center of the Milky Way on October 29.

Wobbling Shadow of the M87* Black Hole VIEW→

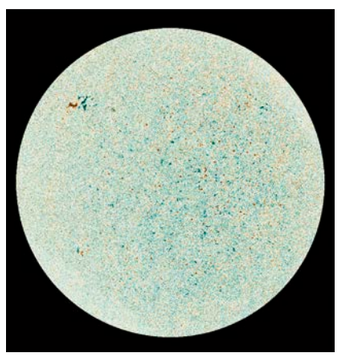
23/09/2020

Analysis of the Event Horizon Telescope observations from 2009-2017 revealed turbulent evolution of the M87* black hole image.

The SO/PHI instrument, on board the Solar Orbiter mission, obtains the first autonomous magnetic map of the Sun VIEW→

16/07/2020

The SO/PHI instrument, on board the Solar Orbiter mission, launched on February, obtained the first autonomous magnetic map of the Sun.



IAA researchers participate in GRANDMA, an international network for the study of gravitational wave sources VIEW→

16/07/2020

IAA researchers showed their participation in GRANDMA, an international network for the study of gravitational wave sources.

First technical light of the JPCam panoramic camera at the Javalambre Astrophysical Observatory VIEW→

16/07/2020

JPCam, the second largest camera wordwide, specially designed for the J-PAS survey, got its first images on June 29th.

Two super-Earths found around the brightest red dwarf star in our solar neighborhood VIEW→

25/06/2020

The Institute of IAA-CSIC participated in the discovery of a multiple planetary system around GJ887, a star located 10.7 light years away.

Detection of the green line of oxygen in the atmosphere of Mars VIEW→

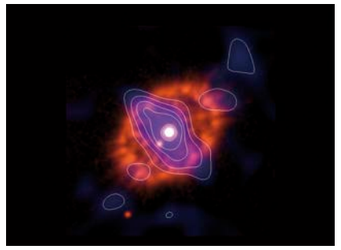
15/06/2020

NOMAD instrument, aboard the ExoMars (ESA) mission in orbit around Mars, detected this diurnal emission of atmospheric oxygen for the first time outside Earth. The green line provides information on the composition and dynamics of the atmosphere, and this detection also allowed to resolve a controversy between atmospheric measurements on land and atomic calculations.

Astronomers discover that novae, a type of explosions in double star systems, expand non-stop VIEW→

10/06/2020

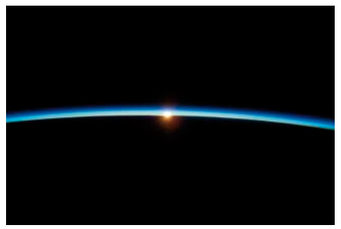
The Institute of IAA-CSIC participates in the study of the expansion of the shell of material ejected by various nova explosions. They found that, contrary to what was assumed, novae expand unrestrained until their end, when they end up dissipating in the inter-stellar médium.



First detection in autumn of an elevated stratopause, a winter atmospheric phenomenon VIEW→

04/06/2020

Researchers from the IAA-CSIC detected, in data files from 2009, an elevated stratopause in November, a phenomenon never seen outside the winter period.



IAA cosmic dust laboratory reinvents itself to study the detection of coronavirus on surfaces VIEW→

22/05/2020

The IAA-CSIC is involved in a project financed by the Carlos III Health Institute for the development of a prototype to analyze surfaces contaminated by SARS-CoV-2. The IAA would contribute with polarimetry studies to the project, which combined image acquisition in the entire optical and sub-millimeter range and its analysis with artificial intelligence.

The IAA studies the influence of state of alarm on light pollution levels VIEW→

05/05/2020

The project, developed by the IAA-CSIC Sky Quality Office and with the support of the Granada City Council, would analyze how the environmental conditions during the lock-down affected light pollution levels.

The Event Horizon Telescope reveals unexpected structures in quasar 3C279 VIEW→

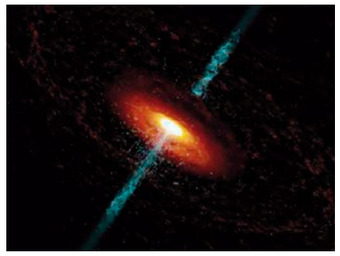
07/04/2020

InApril2019 the Event Horizon Telescope (EHT) collaboration released the first image of a black hole. In 2020 they looked in detail at the high-speed jet of material emerging from a supermassive black hole.

The merger of two galaxies generates the juvenile version of a blazar, one of the most energetic objects known VIEW→

07/04/2020

The first unequivocal detection of a jet of material at very high speed emerging from a galaxy in collision with another was obtained. The jet emerges from the galaxy's central supermassive black hole and is seen head-on, a precursor structure to the formation of a blazar.



A companion star: possible origin of the complex shapes of planetary nebulae VIEW→

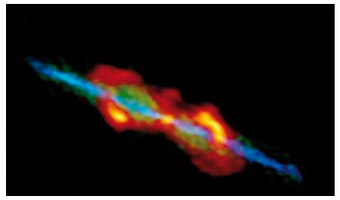
27/03/2020

Data from the TESS space telescope showed variability in a sample of planetary nebulae, compatible with the presence of a companion star. This binarity could explain the complex morphologies of these objects, which result from the death of low and intermediate mass stars.

The metamorphosis of a star in the final phases of its life VIEW→

10/03/2020

ALMA radiotelescope captured a star in its evolution towards a planetary nebula.



A thesis developed at the IAA is awarded the 2020 MERAC 2020 in new technologies (Instrumental) VIEW→

09/03/2020

The optical engineer Concepción Cárdenas Vázquez was awarded with the MERAC Prize for the Best Doctoral Thesis in New Technologies (Instrumental) by the European Astronomical Society (EAS).

A more sustainable observatory: Calar Alto will be converted into an "energy island" VIEW→

06/03/2020

Calar Alto Observatory, scientifically co-managed by the IAA-CSIC, started its energy transition programme thanks to a ERDF (European Regional Development Fund)-supported project. Using biomass and solar energy will considerably reduce the ecological footprint of the observatory, as well as the costs associated to its energy needs.

MEGARA instrument enters the heart of the active galaxy NGC 7469 VIEW→

04/03/2020

A study led by the IAA-CSIC revealed the existence of two rotating gas discs in the vicinity of the galaxy's supermassive black hole, as well as a third component that points to turbulent movements.

Astronomers get the whole film of how a black hole ejects matter and interacts with the medium VIEW→

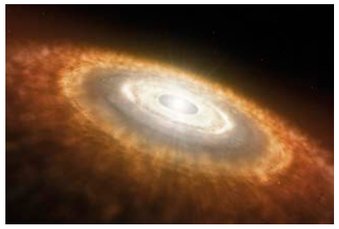
02/03/2020

The black hole, which forms a binary system with a sun-like star, experienced an ejection of matter that transported gas over huge distances.

A study reveals what the seeds of the solid bodies of the Solar System looked like: porous dust particles a few millimetres long VIEW→

25/02/2020

The IAA-CSIC led an investigation that shows, for the first time experimentally, the features of the particles of a comet's nucleus.



The Institute of Astrophysics of Andalusia, Medal of Andalusia 2020 VIEW→

24/02/2020

Awarded by the Junta de Andalucía, the IAA-CSIC obtained the Medal of Research, Science and Health.

The Institute of Astrophysics of Andalusia receives the visit of its External Scientific Advisory Board VIEW→

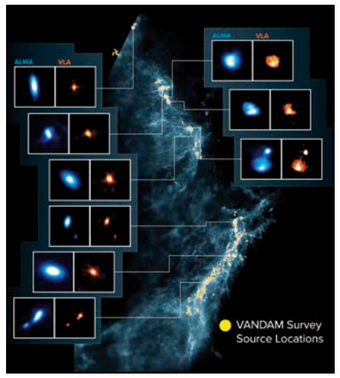
24/02/2020

Appointed by the presidency of the Higher Council for Scientific Research (CSIC), the Board is made up of ten internationally renowned experts.

More than three hundred planet-forming disks around young stars found in the Orion Clouds VIEW→

18/02/2020

ALMA and VLA radiotelescopes enter the Orion Clouds, a stellar nursery that reveals how newborn stars evolve and develop protoplanetary discs. Researchers from the IAA-CSIC participated in the work, which constitutes the largest survey of this type performed to date.



International Day of Women and Girls in Science VIEW→

10/02/2020

The IAA-CSIC joined the celebration of the International Day of Women and Girls in Science, which seeks to make visible the scientific work of women and promote vocations in girls.

Solar Orbiter mission takes off towards its orbit around the Sun VIEW→

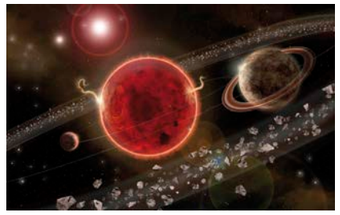
06/02/2020

The mission, which will observe the Sun from an unprecedented perspective, will study both solar physics and the influence of the Sun on the interplanetary environment. The IAA-CSIC co-leads SO/PHI, the largest of the ten instruments on board the misión.

Indications of the existence of a second planet around Proxima Centauri, the closest star to the Sun VIEW→

15/01/2020

With a minimum mass of about six times that of the Earth, the planet would revolve around the star at 1.5 times the distance between the Earth and the Sun. This study adds to a previous work that points to the existence of a complex planetary system around Proxima Centauri.



List of publications

1 Abia C., *et al.* (includes Amado P.J. and Rodríguez López C.)
"The CARMENES search for exoplanets around M dwarfs: Rubidium abundances in nearby cool stars", *Astronomy and Astrophysics*, Vol. 642, Number A227, p. A227 (2020)
DOI: 10.1051/0004-6361/202039032

2 Acciari, V. A. *et al.* (includes Agudo, I.)
"Unraveling the Complex Behavior of Mrk 421 with Simultaneous X-Ray and VHE Observations during an Extreme Flaring Activity in 2013 April", *Astrophysical Journal Supplement Series*, Vol. 248, p. 29 (2020)
DOI: 10.3847/1538-4365/ab89b5

3 Ackley, K. *et al.* (includes Castro-Tirado, A. J.; Hu, Y. -D.; Kann, D. A.)
"Observational constraints on the optical and near-infrared emission from the neutron star-black hole binary merger candidate S190814bv", *Astronomy and Astrophysics*, Vol. 643, p. A113 (2020)
DOI: 10.1051/0004-6361/202037669

4 Aguirre V.S. *et al.* (includes Suárez J.C.)
"Detection and Characterization of Oscillating Red Giants: First Results from the TESS Satellite", *Astrophysical Journal Letters,* Vol. 889, Number L34 (2020)
DOI: 10.3847/2041-8213/ab6443

5 Alali H., Gong Z., Videen G., Pan Y.-L., Muñoz O., Wang C.
"Laser spectroscopic characterization of single extraterrestrial dust particles using optical trapping-cavity ringdown and Raman spectroscopy", *Journal of Quantitative Spectroscopy and Radiative Transfer,* Vol. 255, Number 107249, p. 107249 (2020)
DOI: 10.1016/j.jqsrt.2020.107249

6 Albert, K. *et al.* (includes Orozco Suárez, D., del Toro Iniesta, J.C.)
"Autonomous on-board data processing and instrument calibration software for the Polarimetric and Helioseismic Imager on-board the Solar Orbiter mission", *Journal of Astronomical Telescopes, Instruments, and Systems*, Vol. 6, Issue 4, p. 048004 (2020)
DOI: 10.1117/1.JATIS.6.4.048004

7 Alí-Lagoa, V.; Müller, T. G.; Kiss, C.; Szakáts, R.; Marton, G.; Farkas-Takács, A.; Bartczak, P.; Butkiewicz-BĐk, M.; DudziĐski, G.; Marciniak, A.; Podlewska-Gaca, E.; Duffard, R.; Santos-Sanz, P.; Ortiz, J. L.
"Thermal properties of large main-belt asteroids observed by Herschel PACS", *Astronomy and Astrophysics,* Vol. 638, p. A84 (2020)
DOI: 10.1051/0004-6361/202037718

8 Aller A., Lillo-Box J., Jones D., Miranda L.F., Barceló Forteza S.
"Planetary nebulae seen with TESS: Discovery of new binary central star candidates from Cycle 1", *Astronomy and Astrophysics,* Vol. 635, Number A128, p. A128 (2020)
DOI: 10.1051/0004-6361/201937118

9 Alvarez-Candal, Alvaro; Souza-Feliciano, Ana Carolina; Martins-Filho, Walter; Pinilla-Alonso, Noemí; Ortiz, José Luis
"The Dwarf Planet Makemake as seen by X-Shooter", *Monthly Notices of the Royal Astronomical Society,* p. 5473-5479 (2020)
DOI: 10.1093/mnras/staa2329

10 Amaro-Seoane P., Chen X., Schödel R., Casanellas J.
"Making bright giants invisible at the Galactic Centre", *Monthly Notices of the Royal Astronomical Society,* Vol. 492, p. 250-255 (2020)
DOI: 10.1093/mnras/stz3507

11 Andreoni, I. *et al.* (includes Castro-Tirado, A. J.; Hu, Y.)
"GROWTH on S190814bv: Deep Synoptic Limits on the Optical/Near-infrared Counterpart to a Neutron Star-Black Hole Merger", *Astrophysical Journal,* Vol. 890, p. 131 (2020)
DOI: 10.3847/1538-4357/ab6a1b

12 Añez-López, N.; Osorio, M.; Busquet, G.; Girart, J. M.; Macías, E.; Carrasco-González, C.; Curiel, S.; Estalella, R.; Fernández-López, M.; Galván-Madrid, R.; Kwon, J.; Torrelles, J. M.
"Modeling the Accretion Disk around the High-mass Protostar GGD 27-MM1", *Astrophysical Journal,* Vol. 888, p. 41 (2020)
DOI: 10.3847/1538-4357/ab5dbc

13 Antier, S. *et al.* (includes Blažek, M.; Kann, D. A.; Thöne, C. C.; de Ugarte Postigo, A.)
"The first six months of the Advanced LIGO's and Advanced Virgo's third observing run with GRANDMA", *Monthly Notices of the Royal Astronomical Society,* Vol. 492, Number 3, p. 3904-3927 (2020)
DOI: 10.1093/mnras/stz3142

14 Antier, S. *et al.* (includes Blažek, M.; Kann, D. A.; Thöne, C. C.; de Ugarte Postigo, A.)
"GRANDMA Observations of Advanced LIGO's and Advanced Virgo's Third Observational Campaign", *Monthly Notices of the Royal Astronomical Society,* 497, p. 5518-5539 (2020)
DOI: 10.1093/mnras/staa1846

15 Aparicio Resco, Miguel; Maroto, Antonio L.; Alcaniz, Jailson S.; Abramo, L. Raul; Hernández-Monteagudo, C.; Benítez, N.; Carneiro, S.; Cenarro, A. J.; Cristóbal-Hornillos, D.; Dupke, R. A.; Ederoclite, A.; López-Sanjuan, C.; Marín-Franch, A.; Moles, M.; Oliveira, C. M.; Sodré, L., Jr.; Taylor, K.; Varela, J.; Vázquez Ramió, H.
"J-PAS: forecasts on dark energy and modified gravity theories", *Monthly Notices of the Royal Astronomical Society,* p. 3616-3631 (2020)
DOI: 10.1093/mnras/staa367

16 Arrechea J., Barceló C., Carballo-Rubio R., Garay L.J.
"Schwarzschild geometry counterpart in semiclassical gravity", *Physical Review D - Particles, Fields, Gravitation and Cosmology,* Vol. 101, Number 064059, p. 064059 (2020)
DOI: 10.1103/PhysRevD.101.064059

17 Auchère, F. *et al.* (includes Orozco Suarez, D.; del Toro Iniesta, J. C.)
"Coordination within the remote sensing payload on the Solar Orbiter mission", *Astronomy and Astrophysics,* Vol. 642, p. A6 (2020)
DOI: 10.1051/0004-6361/201937032

18 Ayala, Adrián; Lopes, Ilidio; García Hernández, Antonio; Suárez, Juan Carlos; Muñoz Elorza, Íñigo
"Constraining dark photon properties with Asteroseismology", *Monthly Notices of the Royal Astronomical Society,* Vol. 491, p. 409-416 (2020)
DOI: 10.1093/mnras/stz3002

19 Bailén, F. J.; Orozco Suárez, D.; del Toro Iniesta, J. C.
"On Fabry-Pérot Etalon-based Instruments. III. Instrument Applications", *Astrophysical Journal Supplement Series,* Vol. 246, p. 17 (2020)
DOI: 10.3847/1538-4365/ab5db4

20 Baratella, M *et al.* (includes Alfaro, E. J.)
"The Gaia-ESO Survey: a new approach to chemically characterising young open clusters. I. Stellar parameters, and iron-peak, α-, and proton-capture elements", *Astronomy and Astrophysics,* Vol. 634, p. A34 (2020)
DOI: 10.1051/0004-6361/201937055

21 Barceló Forteza, S.; Moya, A.; Barrado, D.; Solano, E.; Martín-Ruiz, S.; Suárez, J. C.; García Hernández, A.
"Unveiling the power spectra of δ Scuti stars with TESS. The temperature, gravity, and frequency scaling relation", *Astronomy and Astrophysics,* Vol. 638, p. A59 (2020)
DOI: 10.1051/0004-6361/201937262

22 Barceló, Carlos; Boyanov, Valentin; Carballo-Rubio, Raúl; Garay, Luis J.
"Asymptotic horizon formation, spacetime stretching, and causality", *Physical Review D - Particles, Fields, Gravitation and Cosmology,* Vol. 102, p. 045001 (2020)
DOI: 10.1103/PhysRevD.102.045001

23 Baroch, D.; *et al.* (includes Amado, P. J. and Rodríguez-López, C.)
"The CARMENES search for exoplanets around M dwarfs. Convective shift and starspot constraints from chromatic radial velocities", *Astronomy and Astrophysics,* Vol. 641, p. A69 (2020)
DOI: 10.1051/0004-6361/202038213

24 Barrera-Ballesteros, Jorge K.; Utomo, Dyas; Bolatto, Alberto D.; Sánchez, Sebastián F.; Vogel, Stuart N.; Wong, Tony; Levy, Rebecca C.; Colombo, Dario; Kalinova, Veselina; Teuben, Peter; García-Benito, Rubén; Husemann, Bernd; Mast, Damián; Blitz, Leo.

"The EDGE-CALIFA survey: using optical extinction to probe the spatially resolved distribution of gas in nearby galaxies", *Monthly Notices of the Royal Astronomical Society,* Vol. 492, p. 2651-2662 (2020)

DOI: 10.1093/mnras/stz3553

25 Bauer, F. F. *et al.* (includes Zechmeister, M., Kaminski, A., Rodríguez López, C. Becerril Jarque, S., Rodríguez, E. and Amado, P. J.)

"The CARMENES search for exoplanets around M dwarfs. Measuring precise radial velocities in the near infrared: The example of the super-Earth CD Cet b", *Astronomy and Astrophysics,* Vol. 640, p. A50 (2020)

DOI: 10.1051/0004-6361/202038031

26 Bell, C. *et al.* (includes Martínez-Delgado, D.)

"The intrinsic reddening of the Magellanic Clouds as traced by background galaxies - II. The Small Magellanic Cloud", *Monthly Notices of the Royal Astronomical Society,* p. 993 (2020)

DOI: 10.1093/mnras/staa2786

27 Berlanas, S. R.; Herrero, A.; Comerón, F.; Simón-Díaz, S.; Lennon, D. J.; Pasquali, A.; Maíz Apellániz, J.; Sota, A.; Pellerín, A.

"Spectroscopic characterization of the known O-star population in Cygnus OB2. Evidence of multiple star-forming bursts", *Astronomy and Astrophysics,* Vol. 642, p. A168 (2020)

DOI: 10.1051/0004-6361/202039015

28 Blanc M. *et al.* (includes Lara, L.)

"Joint Europa Mission (JEM): a multi-scale study of Europa to characterize its habitability and search for extant life", *Planetary and Space Science,* Vol. 193, Number 104960 (2020)

DOI: 10.1016/j.pss.2020.104960

29 Bluhm P. *et al.* (includes Amado P.J., Rodríguez-López C.)

"Precise mass and radius of a transiting super-Earth planet orbiting the M dwarf TOI-1235: A planet in the radius gap?", *Astronomy and Astrophysics,* Vol. 639, Number A132, p. A132 (2020)

DOI: 10.1051/0004-6361/202038160

30 Bok, J.; Skelton, R. E.; Cluver, M. E.; Jarrett, T. H.; Jones, M. G.; Verdes-Montenegro, L.

"HI study of isolated and pair galaxies: the MIR SFR-M· sequence", *Monthly Notices of the Royal Astronomical Society,* p. 3193-3213 (2020)

DOI: 10.1093/mnras/staa3034

31 Boldt S., Oshagh M., Dreizler S., Mallonn M., Santos N.C., Claret A., Reiners A., Sedaghati E.

"Stellar activity consequence on the retrieved transmission spectra through chromatic Rossiter-McLaughlin observations", *Astronomy and Astrophysics,* Vol. 635, Number A123, p. A123 (2020)

DOI: 10.1051/0004-6361/201937419

32 Bon N., Marziani P., Bon E., Negrete C.A., Dultzin D., Del Olmo A., D'Onofrio M., Martínez-Aldama M.L.

"Selection of highly-accreting quasars: Spectral properties of Fe II opt emitters not belonging to extreme Population A", *Astronomy and Astrophysics,* Vol. 635, Number A151, p. A151 (2020)

DOI: 10.1051/0004-6361/201936773

33 Bongiovanni, Á. *et al.* (includes Cerviño, M.; Alfaro, E. J.; Fernández-Lorenzo, M.; Pović, M.)

"The OTELO survey. A case study of [O III] λ4959,5007 emitters at <z> = 0.83", *Astronomy and Astrophysics*, Vol. 635, p. A35 (2020)

DOI: 10.1051/0004-6361/201833656

34 Breda I., Papaderos P., Gomes J.M., Vílchez J.M., Ziegler B.L., Hirschmann M., Cardoso L.S.M., Lagos P., Buitrago F.

"Stellar age gradients and inside-out star formation quenching in galaxy bulges", *Astronomy and Astrophysics,* Vol. 635, Number A177, p. A177 (2020)

DOI: 10.1051/0004-6361/201937193

35 Bright, J. S. *et al.* (includes Moldon, J.)

"An extremely powerful long-lived superluminal ejection from the black hole MAXI J1820+070", *Nature Astronomy,* p. 697-703 (2020)

DOI: 10.1038/s41550-020-1023-5

36 Broderick A.E., *et al.* (includes Alberdi A., Gómez J.L., Zhao G.)

"THEMIS: A Parameter Estimation Framework for the Event Horizon Telescope", *Astrophysical Journal,* Vol. 897, Number 139, p. 139 (2020)

DOI: 10.3847/1538-4357/ab91a4

37 Bruni G., Savolainen T., Gómez J.L., Lobanov A.P., Kovalev Y.Y., On behalf of the RadioAstron AGN imaging KSP teams

"Active galactic nuclei imaging programs of the RadioAstron mission", *Advances in Space Research,* Vol. 65, p. 712-719 (2020)

DOI: 10.1016/j.asr.2019.03.044

38 Buie, M. W. *et al.* (includes Santos-Sanz, P.)

"Size and Shape Constraints of (486958) Arrokoth from Stellar Occultations", *Astronomical Journal,* Vol. 159, p. 130 (2020)

DOI: 10.3847/1538-3881/ab6ced

39 Bunce E.J., *et al.* (includes Lara L.M.)

"The BepiColombo Mercury Imaging X-Ray Spectrometer: Science Goals, Instrument Performance and Operations", *Space Science Reviews,* Vol. 216, Number 126, p. 126 (2020)

DOI: 10.1007/s11214-020-00750-2

40 Caballero Navarro, R.; García Hernández, A.; Ayala, A.; Suárez, J. C.

"Study of the effects of magnetic braking on the lithium abundances of the Sun and solar-type stars", *Monthly Notices of the Royal Astronomical Society,* Vol. 496, p. 1343 (2020)

DOI: 10.1093/mnras/staa1569

41 Cambianica P., Fulle M., Cremonese G., Simioni E., Naletto G., Massironi M., Penasa L., Lucchetti A., Pajola M., Bertini I., Bodewits D., Ceccarelli C., Ferri F., Fornasier S., Frattin E., Güttler C., Gutiérrez P.J., Keller H.U., Kührt E., Küppers M., La Forgia F., Lazzarin M., Marzari F., Mottola S., Sierks H., Toth I., Tubiana C., Vincent J.-B.

"Time evolution of dust deposits in the Hapi region of comet 67P/Churyumov-Gerasimenko", *Astronomy and Astrophysics,* Vol. 636, Number A91, p. A91 (2020)

DOI: 10.1051/0004-6361/202037485

42 Carrillo-Sánchez J.D., Gómez-Martín J.C., Bones D.L., Nesvorný D., Pokorný P., Benna M., Flynn G.J., Plane J.M.C.

"Cosmic dust fluxes in the atmospheres of Earth, Mars, and Venus", *Icarus,* Vol. 335, Number 113395, p. 113395 (2020)

DOI: 10.1016/j.*icarus*.2019.113395

43 Carvalho, S. P.; Dors, O. L.; Cardaci, M. V.; Hägele, G. F.; Krabbe, A. C.; Pérez-Montero, E.; Monteiro, A. F.; Armah, M.; Freitas-Lemes, P.

"Chemical abundances of Seyfert 2 AGNs- II. N2 metallicity calibration based on SDSS", *Monthly Notices of the Royal Astronomical Society,* p. 263 (2020)

DOI: 10.1093/mnras/staa193

44 Casal, Estefanía; Fernández, Matilde; Alfaro, Emilio J.; Casanova, Víctor; Tobaruela, Ángel

"Fast rotating giant stars behind the Coma Berenices star cluster", *Monthly Notices of the Royal Astronomical Society,* p. 2562-2568 (2020)

DOI: 10.1093/mnras/staa2093

45 Casali, G *et al.* (includes Alfaro, E.)

"The Gaia-ESO survey: the non-universality of the age-chemical-clocks-metallicity relations in the Galactic disc", *Astronomy and Astrophysics,* Vol. 639, p. A127 (2020)

DOI: 10.1051/0004-6361/202038055

46 Casasayas-Barris N., Pallé E., Yan F., Chen G., Luque R., Stangret M., Nagel E., Zechmeister M., Oshagh M., Sanz-Forcada J., Nortmann L., Alonso-Floriano F.J., Amado P.J., Caballero J.A., Czesla S., Khalafinejad S., López-Puertas M., López-Santiago J., Molaverdikhani K., Montes D., Quirrenbach A., Reiners A., Ribas I., Sánchez-López A., Zapatero Osorio M.R.

"Is there Na i in the atmosphere of HD 209458b?: Effect of the centre-to-limb variation and Rossiter-McLaughlin effect in transmission spectroscopy studies", *Astronomy and Astrophysics,* Vol. 635, Number A206, p. A206 (2020)

DOI: 10.1051/0004-6361/201937221

47 Castro-Tirado M.A., Castro-Tirado A.J.

"A typological study of astronomical observatories [Estudio tipológico de los observatorios astronómicos]", *Informes de la Construccion,* Vol. 72, Number e348 (2020)

DOI: 10.3989/ic.72890

48 Catalán-Torrecilla, C.; Castillo-Morales, Á.; Gil de Paz, A.; Gallego, J.; Carrasco, E.; Iglesias-Páramo, J.; Cedazo, R.; Chamorro-Cazorla, M.; Pascual, S.; García-Vargas, M. L.; Cardiel, N.; Gómez-Alvarez, P.; Pérez-Calpena, A.; Martínez-Delgado, I.; Dullo, B. T.; Coelho, P.; Bruzual, G.; Charlot, S.

"Spatially Resolved Analysis of Neutral Winds, Stars, and Ionized Gas Kinematics with MEGARA/GTC: New Insights on the Nearby Galaxy UGC 10205", *Astrophysical Journal,* Vol. 890, p. 5 (2020)

DOI: 10.3847/1538-4357/ab63ca

49 Cazzoli, S.; Gil de Paz, A.; Márquez, I.; Masegosa, J.; Iglesias, J.; Gallego, J.; Carrasco, E.; Cedazo, R.; García-Vargas, M. L.; Castillo-Morales, Á.; Pascual, S.; Cardiel, N.; Pérez-Calpena, A.; Gómez-Alvarez, P.; Martínez-Delgado, I.; Hermosa-Muñoz, L.

"NGC 7469 as seen by MEGARA: new results from high-resolution IFU spectroscopy", *Monthly Notices of the Royal Astronomical Society*, p. 3656-3675 (2020)

DOI: 10.1093/mnras/staa409

50 Chatzistergos, Theodosios; Ermolli, Ilaria; Krivova, Natalie A.; Solanki, Sami K.; Banerjee, Dipankar; Barata, Teresa; Belik, Marcel; Gafeira, Ricardo; Garcia, Adriana; Hanaoka, Yoichiro; Hegde, Manjunath; Klimeš, Jan; Korokhin, Viktor V.; Lourenço, Ana; Malherbe, Jean-Marie; Marchenko, Gennady P.; Peixinho, Nuno; Sakurai, Takashi; Tlatov, Andrey G.

"Analysis of full-disc Ca II K spectroheliograms. III. Plage area composite series covering 1892-2019", *Astronomy and Astrophysics,* Vol. 639, p. A88 (2020)

DOI: 10.1051/0004-6361/202037746

51 Chian, Abraham C.L.; Silva, Suzana S.A.; Rempel, Erico L.; Rubio, Luis R.Bellot; Gošić, Milan; Kusano, Kanya; Park, Sung Hong

"Lagrangian chaotic saddles and objective vortices in solar plasmas", *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics,* Vol. 102, Number 060201, p. 060201 (2020)

DOI: 10.1103/PhysRevE.102.060201

52 Cifuentes, C.; Caballero, J. A.; Cortés-Contreras, M.; Montes, D.; Abellán, F. J.; Dorda, R.; Holgado, G.; Zapatero Osorio, M. R.; Morales, J. C.; Amado, P. J.; Passegger, V. M.; Quirrenbach, A.; Reiners, A.; Ribas, I.; Sanz-Forcada, J.; Schweitzer, A.; Seifert, W.; Solano, E.

"CARMENES input catalogue of M dwarfs. V. Luminosities, colours, and spectral energy distributions", *Astronomy and Astrophysics,* Vol. 642, p. A115 (2020)

DOI: 10.1051/0004-6361/202038295

53 Claret, A.; Cukanovaite, E.; Burdge, K.; Tremblay, P. -E.; Parsons, S.; Marsh, T. R.

"Doppler beaming factors for white dwarfs, main sequence stars, and giant stars. Limb-darkening coefficients for 3D (DA and DB) white dwarf models", *Astronomy and Astrophysics,* Vol. 641, p. A157 (2020)

DOI: 10.1051/0004-6361/202038436

54 Claret, A.; Cukanovaite, E.; Burdge, K.; Tremblay, P. -E.; Parsons, S.; Marsh, T. R.

"Gravity and limb-darkening coefficients for compact stars: DA, DB, and DBA eclipsing white dwarfs", *Astronomy and Astrophysics,* Vol. 634, p. A93 (2020)

DOI: 10.1051/0004-6361/201937326

55 Cremonese G. *et al.* (includes Lara L.)

"SIMBIO-SYS: Scientific Cameras and Spectrometer for the BepiColombo Mission", *Space Science Reviews,* Vol. 216, Number 75, p. 75 (2020)

DOI: 10.1007/s11214-020-00704-8

56 Dainotti, M. G.; Livermore, S.; Kann, D. A.; Li, L.; Oates, S.; Yi, S.; Zhang, B.; Gendre, B.; Cenko, B.; Fraija, N.

"The Optical Luminosity-Time Correlation for More than 100 Gamma-Ray Burst Afterglows", *Astrophysical Journal Letters,* Vol. 905, Issue 2, p. L26 (2020)

DOI: 10.3847/2041-8213/abcda9

57 Damasso M., Del Sordo F., Anglada-Escudé G., Giacobbe P., Sozzetti A., Morbidelli A., Pojmanski G., Barbato D., Butler R.P., Jones H.R.A., Hambsch F.-J., Jenkins J.S., López-González M.J., Morales N., Peña Rojas P.A., Rodríguez-López C., Rodríguez E., Amado P.J., Anglada G., Feng F., Gómez J.F.

"A low-mass planet candidate orbiting Proxima Centauri at a distance of 1.5 AU", *Science Advances,* Vol. 6, p. eaax7467 (2020)

DOI: 10.1126/sciadv.aax7467

58 De Blok W.J.G. *et al.* (includes Román J., Verdes-Montenegro L.)

"MeerKAT HI commissioning observations of MHONGOOSE galaxy ESO 302-G014", *Astronomy and Astrophysics,* Vol. 643, Number 38894, p. A147 (2020)

DOI: 10.1051/0004-6361/202038894

59 de Diego, J. A. *et al.* (includes Pović, M., Alfaro, E. J., Fernández-Lorenzo, M.)

"Galaxy classification: deep learning on the OTELO and COSMOS databases", *Astronomy and Astrophysics,* Vol. 638, p. A134 (2020)

DOI: 10.1051/0004-6361/202037697

60 de León, J.; Licandro, J.; de la Fuente Marcos, C.; de la Fuente Marcos, R.; Lara, L. M.; Moreno, F.; Pinilla-Alonso, N.; Serra-Ricart, M.; De Prá, M.; Tozzi, G. P.; Souza-Feliciano, A. C.; Popescu, M.; Scarpa, R.; Font Serra, J.; Geier, S.; Lorenzi, V.; Harutyunyan, A.; Cabrera-Lavers, A.

"Visible and near-infrared observations of interstellar comet 2I/Borisov with the 10.4-m GTC and the 3.6-m TNG telescopes", *Monthly Notices of the Royal Astronomical Society,* Vol. 495, p. 2053-2062 (2020)

DOI: 10.1093/mnras/staa1190

61 de Ugarte Postigo, A. *et al.* (includes Thöne, C. C., Kann, D. A., Bensch, K. and Izzo, L.)

"GRB 190114C in the nuclear region of an interacting galaxy. A detailed host analysis using ALMA, the HST, and the VLT", *Astronomy and Astrophysics,* Vol. 633, p. A68 (2020)

DOI: 10.1051/0004-6361/201936668

62 del Moral-Castro, I.; García-Lorenzo, B.; Ramos Almeida, C.; Ruiz-Lara, T.; Falcón-Barroso, J.; Sánchez, S. F.; Sánchez-Blázquez, P.; Márquez, I.; Masegosa, J.

"Larger λR in the disc of isolated active spiral galaxies than in their non-active twins", *Astronomy and Astrophysics*, Vol. 639, p. L9 (2020)

DOI: 10.1051/0004-6361/202038091

63 Della Valle M., Izzo L.

"Observations of galactic and extragalactic novae", *Astronomy and Astrophysics Review,* Vol. 28, Number 3 (2020)

DOI: 10.1007/s00159-020-0124-6

64 Demory, B. -O. eta l. (includesSuárez, J. C.)

"A super-Earth and a sub-Neptune orbiting the bright, quiet M3 dwarf TOI-1266", *Astronomy and Astrophysics,* Vol. 642, p. A49 (2020)

DOI: 10.1051/0004-6361/202038616

65 Dors, O. L.; Freitas-Lemes, P.; Amôres, E. B.; Pérez-Montero, E.; Cardaci, M. V.; Hägele, G. F.; Armah, M.; Krabbe, A. C.; Faúndez-Abans, M.

"Chemical abundances of Seyfert 2 AGNs - I. Comparing oxygen abundances from distinct methods using SDSS", *Monthly Notices of the Royal Astronomical Society,* Vol. 492, p. 468-479 (2020)

DOI: 10.1093/mnras/stz3492

66 Dors, O. L.; Maiolino, R.; Cardaci, M. V.; Hägele, G. F.; Krabbe, A. C.; Pérez-Montero, E.; Armah, M.

"Chemical abundances of Seyfert 2 AGNs - III. Reducing the oxygen abundance discrepancy", *Monthly Notices of the Royal Astronomical Society,* p. 3209 (2020)

DOI: 10.1093/mnras/staa1781

67 Dreizler, S. *et al.* (includes Aceituno, J.; Amado, P. J.; Bauer, F. F.)

"The CARMENES search for exoplanets around M dwarfs: LP 714-47 b (TOI 442.01): Populating the Neptune desert", *Astronomy and Astrophysics,* Vol. 644, Number A127, p. A127 (2020)

DOI: 10.1051/0004-6361/202038016

68 Dreizler, S.; Jeffers, S. V.; Rodríguez, E.; Zechmeister, M.; Barnes, J. R.; Haswell, C. A.; Coleman, G. A. L.; Lalitha, S.; Hidalgo Soto, D.; Strachan, J. B. P.; Hambsch, F. -J.; López-González, M. J.; Morales, N.; Rodríguez López, C.; Berdiñas, Z. M.; Ribas, I.; Pallé, E.; Reiners, A.; Anglada-Escudé, G.

"Red Dots: A temperate 1.5 Earth-mass planet candidate in a compact multi-terrestrial planet system around GJ 1061★", *Monthly Notices of the Royal Astronomical Society*, p. 536-550 (2020)

DOI: 10.1093/mnras/staa248

69 Dultzin, Deborah; Marziani, Paola; de Diego, J. A.; Negrete, C. A.; Del Olmo, Ascensión; Martínez-Aldama, Mary L.; D'Onofrio, Mauro; Bon, Edi; Bon, Natasa; Stirpe, Giovanna M.

"Extreme quasars as distance indicators in cosmology", *Frontiers in Astronomy and Space Sciences,* Vol. 6, p. 80 (2020)

DOI: 10.3389/fspas.2019.00080

70 Eatough R., *et al.* (includes Alberdi A., Gómez J.L.)

"Verification of Radiative Transfer Schemes for the EHT", *Astrophysical Journal,* Vol. 897, Number 148, p. 148 (2020)

DOI: 10.3847/1538-4357/ab96c6

71 Espinosa-Ponce, C.; Sánchez, S. F.; Morisset, C.; Barrera-Ballesteros, J. K.; Galbany, L.; García-Benito, R.; Lacerda, E. A. D.; Mast, D.

"H ii regions in the CALIFA survey: I. catalogue presentation", *Monthly Notices of the Royal Astronomical Society,* Vol. 494, p. 1622 (2020)

DOI: 10.1093/mnras/staa782

72 Favole, G.; Gonzalez-Perez, V.; Stoppacher, D.; Orsi, Á.; Comparat, J.; Cora, S. A.; Vega-Martínez, C. A.; Stevens, A. R. H.; Maraston, C.; Croton, D.; Knebe, A.; Benson, A. J.; Montero-Dorta, A. D.; Padilla, N.; Prada, F.; Thomas, D.

"[OII] emitters in MULTIDARK -GALAXIES and DEEP2", *Monthly Notices of the Royal Astronomical Society,* p. 5432-5453 (2020)

DOI: 10.1093/mnras/staa2292

73 Feldmeier-Krause A., Kerzendorf W., Do T., Nogueras-Lara F., Neumayer N., Walcher C.J., Seth A., Schödel R., de Zeeuw P.T., Hilker M., Lützgendorf N., Kuntschner H., Kissler-Patig M.

"Asymmetric spatial distribution of subsolar metallicity stars in the Milky Way nuclear star cluster", *Monthly Notices of the Royal Astronomical Society,* Vol. 494, p. 396-410 (2020)

DOI: 10.1093/mnras/staa703

74 Felici, M.; Withers, P.; Smith, M. D.; González-Galindo, F.; Oudrhiri, K.; Kahan, D.

"MAVEN ROSE Observations of the Response of the Martian Ionosphere to Dust Storms", *Journal of Geophysical Research A: Space Physics,* Vol. 125, p. e27083 (2020)

DOI: 10.1029/2019JA027083

75 Fischer, William J.; Megeath, S. Thomas; Furlan, E.; Stutz, Amelia M.; Stanke, Thomas; Tobin, John J.; Osorio, Mayra; Manoj, P.; Di Francesco, James; Allen, Lori E.; Watson, Dan M.; Wilson, T. L.; Henning, Thomas

"The Herschel Orion Protostar Survey: Far-infrared Photometry and Colors of Protostars and Their Variations across Orion A and B", *Astrophysical Journal,* Vol. 905, Issue 2, p. 119 (2020)

DOI: 10.3847/1538-4357/abc7cb

76 Fossati L., Shulyak D., Sreejith A.G., Koskinen T., Young M.E., Cubillos P.E., Lara L.M., France K., Rengel M., Cauley P.W., Turner J.D., Wyttenbach A., Yan F.

"A data-driven approach to constraining the atmospheric temperature structure of the ultra-hot Jupiter KELT-9b", *Astronomy and Astrophysics,* Vol. 643, Number A131, p. A131 (2020)

DOI: 10.1051/0004-6361/202039061

77 Fuhrmeister, B.; Czesla, S.; Hildebrandt, L.; Nagel, E.; Schmitt, J. H. M. M.; Jeffers, S. V.; Caballero, J. A.; Hintz, D.; Johnson, E. N.; Schöfer, P.; Zechmeister, M.; Reiners, A.; Ribas, I.; Amado, P. J.; Quirrenbach, A.; Nortmann, L.; Bauer, F. F.; Béjar, V. J. S.; Cortés-Contreras, M.; Dreizler, S.; Galadí-Enríquez, D.; Hatzes, A. P.; Kaminski, A.; Kürster, M.; Lafarga, M.; Montes, D.

"The CARMENES search for exoplanets around M dwarfs. Variability of the He I line at 10 830 Å", *Astronomy and Astrophysics,* Vol. 640, p. A52 (2020)

DOI: 10.1051/0004-6361/202038279

78 Gallego-Cano, E.; Schödel, R.; Nogueras-Lara, F.; Dong, H.; Shahzamanian, B.; Fritz, T. K.; Gallego-Calvente, A. T.; Neumayer, N.

"New constraints on the structure of the nuclear stellar cluster of the Milky Way from star counts and MIR imaging", *Astronomy and Astrophysics,* Vol. 634, p. A71 (2020)

DOI: 10.1051/0004-6361/201935303

79 García-Comas, Maya; Funke, Bernd; López-Puertas, Manuel; González-Galindo, Francisco; Kiefer, Michael; Höpfner, Michael

"First Detection of a Brief Mesoscale Elevated Stratopause in Very Early Winter", *Geophysical Research Letters,* Vol. 47, p. e86751 (2020)

DOI: 10.1029/2019GL086751

80 Garcia-Saenz A., De Miguel A.S., Espinosa A., Costas L., Aragonés N., Tonne C., Moreno V., Pérez-Gómez B., Valentin A., Pollán M., Castaño-Vinyals G., Aubé M., Kogevinas M.

"Association between Outdoor Light-at-night Exposure and Colorectal Cancer in Spain", *Epidemiology,* p. 718-727 (2020)

DOI: 10.1097/EDE.0000000000001226

81 García-Vargas, M. L.; Carrasco, E.; Mollá, M.; Gil de Paz, A.; Berlanas, S. R.; Cardiel, N.; Gómez-Alvarez, P.; Gallego, J.; Iglesias-Páramo, J.; Cedazo, R.; Pascual, S.; Castillo-Morales, A.; Pérez-Calpena, A.; Martínez-Delgado, I.

"MEGARA-GTC stellar spectral library: I", *Monthly Notices of the Royal Astronomical Society,* Vol. 493, p. 871-898 (2020)

DOI: 10.1093/mnras/staa126

82 Ge, Xue; Gu, Qiu-Sheng; García-Benito, Rubén; Xiao, Meng-Yuan; Li, Zong-Nan

"The Physical Properties of S0 Galaxy PGC 26218: The Origin of Starburst and Star Formation", *Astrophysical Journal,* Vol. 889, p. 132 (2020)

DOI: 10.3847/1538-4357/ab65f6

83 Gérard, J. -C.; Aoki, S.; Willame, Y.; Gkouvelis, L.; Depiesse, C.; Thomas, I. R.; Ristic, B.; Vandaele, A. C.; Daerden, F.; Hubert, B.; Mason, J.; Patel, M. R.; López-Moreno, J. -J.; Bellucci, G.; López-Valverde, M. A.; Beeckman, B.

"Detection of green line emission in the dayside atmosphere of Mars from NOMAD-TGO observations", *Nature Astronomy,* Vol. 4, p. 1049 (2020)

DOI: 10.1038/s41550-020-1123-2

84 Gkouvelis, L.; Gérard, J. -C.; González-Galindo, F.; Hubert, B.; Schneider, N. M.

"Isobar Altitude Variations in the Upper Mesosphere Observed With IUVS-MAVEN in Response to Martian Dust Storms", *Geophysical Research Letters,* Vol. 47, p. e87468 (2020)

DOI: 10.1029/2020GL087468

85 Gómez Martín J.C., Lewis T.R., Blitz M.A., Plane J.M.C., Kumar M., Francisco J.S., Saiz-Lopez A.

"A gas-to-particle conversion mechanism helps to explain atmospheric particle formation through clustering of iodine oxides", *Nature Communications,* Vol. 11, Number 4521 (2020)

DOI: 10.1038/s41467-020-18252-8

86 Gómez-González V.M.A., Toalá J.A., Guerrero M.A., Todt H., Sabin L., Ramos-Larios G., Mayya Y.D.

"Planetary nebulae with Wolf-Rayet-type central stars-I. the case of the high-excitation NGC 2371", *Monthly Notices of the Royal Astronomical Society,* Vol. 496, p. 959-973 (2020)

DOI: 10.1093/mnras/staa1542

87 González-Álvarez, E. *et al.* (includes Bauer, F. F.; Rodríguez, E.; López-González, M. J.; Amado, P. J.)

"The CARMENES search for exoplanets around M dwarfs. A super-Earth planet orbiting HD 79211 (GJ 338 B)", *Astronomy and Astrophysics,* Vol. 637, p. A93 (2020)

DOI: 10.1051/0004-6361/201937050

88 Grieco, Francesco; Pérot, Kristell; Murtagh, Donal; Eriksson, Patrick; Forkman, Peter; Rydberg, Bengt; Funke, Bernd; Walker, Kaley A.; Pumphrey, Hugh C.

"Recovery and validation of Odin/SMR long-term measurements of mesospheric carbon monoxide", *Atmospheric Measurement Techniques,* Vol. 13, p. 5013-5031 (2020)

DOI: 10.5194/amt-13-5013-2020

89 Grossi, M.; García-Benito, R.; Cortesi, A.; Gonçalves, D. R.; Gonçalves, T. S.; Lopes, P. A. A.; Menéndez-Delmestre, K.; Telles, E.

"Inverted metallicity gradients in two Virgo cluster star-forming dwarf galaxies: evidence of recent merging?", *Monthly Notices of the Royal Astronomical Society,* Vol. 498, p. 1939-1950 (2020)

DOI: 10.1093/mnras/staa2382

90 Guerrero M.A.

"X-ray observations of planetary nebulae since WORKPLANS I and beyond", *Galaxies,* Vol. 8, Number 24 (2020)

DOI: 10.3390/GALAXIES8010024

91 Guerrero J., López-Ruiz F.F., Aldaya V.

"SU(2)-particle sigma model: Momentumspace quantization of a particle on the sphere S3", *Journal of Physics A: Mathematical and Theoretical,* Vol. 53, Number 145301, p. 145301 (2020)

DOI: 10.1088/1751-8121/ab661d

92 Guerrero, M. A.; Ramos-Larios, G.; Toalá, J. A.; Balick, B.; Sabin, L.

"Rings and arcs around evolved stars. II. The Carbon Star AFGL 3068 and the Planetary Nebulae NGC 6543, NGC 7009 and NGC 7027", *Monthly Notices of the Royal Astronomical Society,* p. 2234-2246 (2020)

DOI: 10.1093/mnras/staa1225

93 Guerrero, Martín A.; Ortiz, Roberto

"The effect of pulsation on the near-ultraviolet spectrum of AGB stars", *Monthly Notices of the Royal Astronomical Society,* Vol. 491, p. 680-689 (2020)

DOI: 10.1093/mnras/stz2966

94 Guerrero, Martín A.; Rechy-García, Jackeline Suzett; Ortiz, Roberto

"Space Velocity and Time Span of Jets in Planetary Nebulae", *Astrophysical Journal,* Vol. 890, p. 50 (2020)

DOI: 10.3847/1538-4357/ab61fa

95 Guglielmino, Salvo L.; Pillet, Valentín Martínez; Ruiz Cobo, Basilio; Bellot Rubio, Luis R.; del Toro Iniesta, José Carlos; Solanki, Sami K.; Riethmüller, Tino L.; Zuccarello, Francesca

"On the Magnetic Nature of an Exploding Granule as Revealed by Sunrise/IMaX", *Astrophysical Journal,* Vol. 896, p. 62 (2020)

DOI: 10.3847/1538-4357/ab917b

96 Guo, Hong; Jones, Michael G.; Haynes, Martha P.; Fu, Jian

"Direct Measurement of the H I-halo Mass Relation through Stacking", *Astrophysical Journal,* Vol. 894, p. 92 (2020)

DOI: 10.3847/1538-4357/ab886f

97 Guseva, N. G.; Izotov, Y. I.; Schaerer, D.; Vílchez, J. M.; Amorín, R.; Pérez-Montero, E.; Iglesias-Páramo, J.; Verhamme, A.; Kehrig, C.; Ramambason, L.

"Properties of five z~0.3-0.4 confirmed LyC leakers: VLT/XShooter observations", *Monthly Notices of the Royal Astronomical Society,* p. 4293-4310 (2020)

DOI: 10.1093/mnras/staa2197

98 Gutiérrez Albarrán, M. L. *et al.* (includes Alfaro, E. J.)

"The Gaia-ESO Survey: Calibrating the lithium-age relation with open clusters and associations. I. Cluster age range and initial membership selections", *Astronomy and Astrophysics,* Vol. 643, p. A71 (2020)

DOI: 10.1051/0004-6361/202037620

99 Gutiérrez-Soto, L. A. *et al.* (includes Guerrero, M. A.)

"J-PLUS: Tools to identify compact planetary nebulae in the Javalambre and southern photometric local Universe surveys", *Astronomy and Astrophysics,* Vol. 633, p. A123 (2020)

DOI: 10.1051/0004-6361/201935700

100 Hanuš, J. *et al.* (includes Duffard, R.)

"(704) Interamnia: a transitional object between a dwarf planet and a typical irregular-shaped minor body", *Astronomy and Astrophysics,* Vol. 633, p. A65 (2020)

DOI: 10.1051/0004-6361/201936639

101 Heald G., *et al.* (includes Damas-Segovia A., Agudo I.)

"Magnetism science with the square kilometre array", *Galaxies*, Vol. 8, Number 53 (2020)

DOI: 10.3390/GALAXIES8030053

102 Hermosa Muñoz, L.; Cazzoli, S.; Márquez, I.; Masegosa, J.

"Optical spectroscopy of type 2 LINERs", *Astronomy and Astrophysics,* Vol. 635, p. A50 (2020)

DOI: 10.1051/0004-6361/201936680

103 Hermosa Muñoz, L.; Taibi, S.; Battaglia, G.; Iorio, G.; Rejkuba, M.; Leaman, R.; Cole, A. A.; Irwin, M.; Jablonka, P.; Kacharov, N.; McConnachie, A.; Starkenburg, E.; Tolstoy, E.

"Kinematic and metallicity properties of the Aquarius dwarf galaxy from FORS2 MXU spectroscopy·", *Astronomy and Astrophysics,* Vol. 634, p. A10 (2020)

DOI: 10.1051/0004-6361/201936136

104 Hidalgo D., *et al.* (includes Amado P., Bryant E., Lampon M.)

"Three planets transiting the evolved star EPIC 249893012: A hot 8.8-M super-Earth and two warm 14.7 and 10.2-M sub-Neptunes", *Astronomy and Astrophysics,* Vol. 636, Number A89, p. A89 (2020)

DOI: 10.1051/0004-6361/201937080

105 Hintz, D. *et al.* (includes Amado, P. J. and Bauer, F. F.)

"The CARMENES search for exoplanets around M dwarfs. The He I infrared triplet lines in PHOENIX models of M 2-3 V stars", *Astronomy and Astrophysics,* Vol. 638, p. A115 (2020)

DOI: 10.1051/0004-6361/202037596

106 Hoder T., Bonaventura Z., Prukner V., Gordillo-Vázquez F.J., Šimek M.

"Emerging and expanding streamer head in low-pressure air", *Plasma Sources Science and Technology,* Vol. 29, Number 03LT01, p. 03LT01 (2020)

DOI: 10.1088/1361-6595/ab7087

107 Hogarth, L.; Amorín, R.; Vílchez, J. M.; Hägele, G. F.; Cardaci, M.; Pérez-Montero, E.; Firpo, V.; Jaskot, A.; Chávez, R.

"Chemodynamics of green pea galaxies - I. Outflows and turbulence driving the escape of ionizing photons and chemical enrichment", *Monthly Notices of the Royal Astronomical Society,* Vol. 494, p. 3541 (2020)

DOI: 10.1093/mnras/staa851

108 Horesh, A. *et al.* (includes Moldon, J.; Pérez-Torres, M.)

"A Non-equipartition Shock Wave Traveling in a Dense Circumstellar Environment around SN 2020oi", *Astrophysical Journal,* Vol. 903, p. 132 (2020)

DOI: 10.3847/1538-4357/abbd38

109 Hu, Chen; Li *et al.* (includes Aceituno, J.)

"Evidence for Two Distinct Broad-line Regions from Reverberation Mapping of PG 0026+129", *Astrophysical Journal,* Vol. 905, p. 75 (2020)

DOI: 10.3847/1538-4357/abc2da

110 Hu, Chen; Li, Yan-Rong; Du, Pu; Zhang, Zhi-Xiang; Li, Sha-Sha; Huang, Ying-Ke; Lu, Kai-Xing; Bai, Jin-Ming; Ho, Luis C.; Bian, Wei-Hao; Brotherton, Michael S.; Yuan, Ye-Fei; Aceituno, Jesús; Winkler, Hartmut; Wang, Jian-Min

"Broad-line Region of the Quasar PG 2130+099 from a Two-year Reverberation Mapping Campaign with High Cadence", *Astrophysical Journal,* Vol. 890, p. 71 (2020)

DOI: 10.3847/1538-4357/ab6a17

111 Huang K.-Y., Kemball A.J., Vlemmings W.H.T., Lai S.-P., Yang L., Agudo I.

"Mapping Circumstellar Magnetic Fields of Late-type Evolved Stars with the Goldreich-Kylafis Effect: CARMA Observations at λ1.3 mm of R Crt and R Leo", *Astrophysical Journal,* Vol. 899, Number 152, p. 152 (2020)

DOI: 10.3847/1538-4357/aba122

112 Imai, Hiroshi; Uno, Yuri; Maeyama, Daichi; Yamaguchi, Ryosuke; Amada, Kei; Hamae, Yuhki; Orosz, Gabor; Gómez, José F.; Tafoya, Daniel; Uscanga, Lucero; Burns, Ross A.

"FLASHING: New high-velocity H2O masers in IRAS 18286-0959", *Publications of the Astronomical Society of Japan,* p. 58 (2020)

DOI: 10.1093/pasj/psaa047

113 Infante-Sainz, Raúl; Trujillo, Ignacio; Román, Javier

"The Sloan Digital Sky Survey extended point spread functions", *Monthly Notices of the Royal Astronomical Society,* Vol. 491, p. 5317-5329 (2020)

DOI: 10.1093/mnras/stz3111

114 Jain, S. K.; Bougher, S. W.; Deighan, J.; Schneider, N. M.; González Galindo, F.; Stewart, A. I. F.; Sharrar, R.; Kass, D.; Murphy, J.; Pawlowski, D.

"Martian Thermospheric Warming Associated With the Planet Encircling Dust Event of 2018", *Geophysical Research Letters*, Vol. 47, p. e85302 (2020)

DOI: 10.1029/2019GL085302

115 Jeffers S.V. *et al.* (includes Rodríguez E., López-González M.J., Morales N., Luque R. and Amado P.J.)

"A multiplanet system of super-Earths orbiting the brightest red dwarf star GJ 887", Science, Vol. 368, p. 1477-1481 (2020)

DOI: 10.1126/science.aaz0795

116 Jones, Michael G.; Hess, Kelley M.; Adams, Elizabeth A. K.; Verdes-Montenegro, Lourdes

"The H i mass function of group galaxies in the ALFALFA survey", *Monthly Notices of the Royal Astronomical Society*, Vol. 494, p. 2090 (2020)

DOI: 10.1093/mnras/staa810

117 Kangas T., Fruchter A.S., Cenko S.B., Corsi A., Postigo A.D.U., Pe'er A., Vogel S.N., Cucchiara A., Gompertz B., Graham J., Levan A., Misra K., Perley D.A., Racusin J., Tanvir N.

"The Late-time Afterglow Evolution of Long Gamma-Ray Bursts GRB 160625B and GRB 160509A", *Astrophysical Journal,* Vol. 894, Number 43, p. 43 (2020)

DOI: 10.3847/1538-4357/ab8799

118 Karnath, N.; Megeath, S. T.; Tobin, J. J.; Stutz, A.; Li, Z. -Y.; Sheehan, P.; Reynolds, N.; Sadavoy, S.; Stephens, I. W.; Osorio, M.; Anglada, G.; Díaz-Rodríguez, A. K.; Cox, E.

"Detection of Irregular, Submillimeter Opaque Structures in the Orion Molecular Clouds: Protostars within 10,000 yr of Formation?", *Astrophysical Journal*, Vol. 890, p. 129 (2020)

DOI: 10.3847/1538-4357/ab659e

119 Kasliwal, M. M. *et al.* (includes Castro-Tirado, A. J., Hu, Y.)

"Kilonova Luminosity Function Constraints Based on Zwicky Transient Facility Searches for 13 Neutron Star Merger Triggers during O3", *Astrophysical Journal*, Vol. 905, Issue 2, p. 145 (2020)

DOI: 10.3847/1538-4357/abc335

120 Kehrig, C.; Iglesias-Páramo, J.; Vílchez, J. M.; de Paz, A. Gil; Puertas, S. Duarte; Pérez-Montero, E.; Díaz, Á. I.; Gallego, J.; Carrasco, E.; Cardiel, N.; García-Vargas, M. L.; Castillo-Morales, A.; Cedazo, R.; Gómez-Álvarez, P.; Martínez-Delgado, I.; Pascual, S.; Pérez-Calpena, A.

"Mapping the ionized gas of the metal-poor HII galaxy PHL 293B with MEGARA", *Monthly Notices of the Royal Astronomical Society*, p. 1638-1650 (2020)

DOI: 10.1093/mnras/staa2299

121 Kemmer J., *et al.* (includes Amado P.J., Rodríguez López C.)

"Discovery of a hot, transiting, Earth-sized planet and a second temperate, non-transiting planet around the M4 dwarf GJ 3473 (TOI-488)", *Astronomy and Astrophysics*, Vol. 642, Number A236, p. A236 (2020)

DOI: 10.1051/0004-6361/202038967

122 Kieu N., Gordillo-Vázquez F.J., Passas M., Sánchez J., Pérez-Invernón F.J., Luque A., Montanyá J., Christian H.

"Submicrosecond Spectroscopy of Lightning-Like Discharges: Exploring New Time Regimes", *Geophysical Research Letters*, Vol. 47, Number e2020GL088755, p. e88755 (2020)

DOI: 10.1029/2020GL088755

123 Kim, J.-Y. *et al.* (includes Gómez, J. L.; Alberdi, A.)

"Event Horizon Telescope imaging of the archetypal blazar 3C 279 at an extreme 20 microarcsecond resolution", *Astronomy and Astrophysics*, Vol. 640, p. A69 (2020)

DOI: 10.1051/0004-6361/202037493

124 Kitanidis, Ellie; White, Martin; Feng, Yu; Schlegel, David; Guy, Julien; Dey, Arjun; Landriau, Martin; Brooks, David; Levi, Michael; Moustakas, John; Prada, Francisco; Tarle, Gregory; Weaver, Benjamin Alan

"Imaging Systematics and Clustering of DESI Main Targets", *Monthly Notices of the Royal Astronomical Society*, p. 2262 (2020)

DOI: 10.1093/mnras/staa1621

125 Klypin, Anatoly; Prada, Francisco; Byun, Joyce

"Suppressing cosmic variance with paired-and-fixed cosmological simulations: average properties and covariances of dark matter clustering statistics", *Monthly Notices of the Royal Astronomical Society*, p. 3862 (2020)

DOI: 10.1093/mnras/staa734

126 Komossa, S.; Grupe, D.; Parker, M. L.; Valtonen, M. J.; Gómez, J. L.; Gopakumar, A.; Dey, L.

"The 2020 April-June super-outburst of OJ 287 and its long-term multiwavelength light curve with Swift: binary supermassive black hole and jet activity", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. L35-L39 (2020)

DOI: 10.1093/mnrasl/slaa125

127 Kool, E. C. *et al.* (includes Pérez-Torres, M. A.)

"AT 2017gbl: a dust obscured TDE candidate in a luminous infrared galaxy", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. 2167-2195 (2020)

DOI: 10.1093/mnras/staa2351

128 Koribalski B.S., *et al.* (includes Jones M.G., Verdes-Montenegro L.)

"WALLABY – an SKA Pathfinder H i survey", *Astrophysics and Space Science*, Vol. 365, Number 118, p. 118 (2020)

DOI: 10.1007/s10509-020-03831-4

129 Kramer, Carsten *et al.* (includes Hermelo, I.)

"Gas and dust cooling along the major axis of M 33 (HerM33es). Herschel/PACS [C II] and [O I] observations", *Astronomy and Astrophysics*, Vol. 639, p. A61 (2020)

DOI: 10.1051/0004-6361/201936754

130 Krause M., Irwin J., Schmidt P., Stein Y., Miskolczi A., Carolina Mora-Partiarroyo S., Wiegert T., Beck R., Stil J.M., Heald G., Li J.-T., Damas-Segovia A., Vargas C.J., Rand R.J., West J., Walterbos R.A.M., Dettmar R.-J., English J., Woodfinden A.

"CHANG-ES: XXII. Coherent magnetic fields in the halos of spiral galaxies", *Astronomy and Astrophysics*, Vol. 639, Number A112, p. A112 (2020)

DOI: 10.1051/0004-6361/202037780

131 Krauz L., Janout P., Blažek M., Páta P.

"Assessing cloud segmentation in the chromacity diagram of all-sky images", *Remote Sensing of Environment*, Vol. 12, Number 1902 (2020)

DOI: 10.3390/rs12111902

132 Kravchenko E.V., Gómez J.L., Kovalev Y.Y., Lobanov A.P., Savolainen T., Bruni G., Fuentes A., Anderson J.M., Jorstad S.G., Marscher A.P., Tornikoski M., Lähteenmäki A., Lisakov M.M.

"Probing the Innermost Regions of AGN Jets and Their Magnetic Fields with RadioAstron. III. Blazar S5 0716+71 at Microarcsecond Resolution", *Astrophysical Journal*, Vol. 893, Number 68, p. 68 (2020)

DOI: 10.3847/1538-4357/ab7dae

133 Kravchenko E.V., Gómez J.L., Kovalev Y.Y., Voitsik P.A.

"The jet of S5 0716 + 71 at μas scales with RadioAstron", *Advances in Space Research*, Vol. 65, p. 720-724 (2020)

DOI: 10.1016/j.asr.2019.01.042

134 Kumar M., Trabelsi T., Gómez Martín J.C., Saiz-Lopez A., Francisco J.S.

"HIOx-IONO2Dynamics at the Air-Water Interface: Revealing the Existence of a Halogen Bond at the Atmospheric Aerosol Surface", *Journal of the American Chemical Society*, Vol. 142, p. 12467-12477 (2020)

DOI: 10.1021/jacs.0c05232

135 Lafarga M. *et al.* (includes Bauer F.F., Amado P.J. and Rodríguez-López C.)

"The CARMENES search for exoplanets around M dwarfs: Radial velocities and activity indicators from cross-correlation functions with weighted binary masks", *Astronomy and Astrophysics*, Vol. 636, Number A36, p. A36 (2020)

DOI: 10.1051/0004-6361/201937222

136 Laine, S. eta l. (includes Gómez, J. L.)

"Spitzer Observations of the Predicted Eddington Flare from Blazar OJ 287", *Astrophysical Journal*, Vol. 894, p. L1 (2020)

DOI: 10.3847/2041-8213/ab79a4

137 Lampón M., López-Puertas M., Lara L.M., Sánchez-López A., Salz M., Czesla S., Sanz-Forcada J., Molaverdikhani K., Alonso-Floriano F.J., Nortmann L., Caballero J.A., Bauer F.F., Pallé E., Montes D., Quirrenbach A., Nagel E., Ribas I., Reiners A., Amado P.J.

"Modelling the He i triplet absorption at 10 830 A in the atmosphere of HD 209458 b", *Astronomy and Astrophysics*, Vol. 636, Number A13, p. A13 (2020)

DOI: 10.1051/0004-6361/201937175

138 Lares-Martiz, M.; Garrido, R.; Pascual-Granado, J.

"Self-consistent method to extract non-linearities from pulsating stars light curves I. Combination frequencies.", *Monthly Notices of the Royal Astronomical Society*, p. 1194-1204 (2020)

DOI: 10.1093/mnras/staa2256

139 Larionov, V. M. *et al.* (includes Agudo, I.; Fuentes, A.; Gómez, J. L.)

"Multiwavelength behaviour of the blazar 3C 279: decade-long study from γ-ray to radio", *Monthly Notices of the Royal Astronomical Society*, p. 3829-3848 (2020)

DOI: 10.1093/mnras/staa082

140 Lee H.-J., Đurech J., Kim M.-J., Moon H.-K., Kim C.-H., Choi Y.-J., Galád A., Pray D., Marciniak A., Kaplan M., Erece O., Duffard R., Gajdoš Š., Világi J., Lehký M.

"Shape model and spin state of non-principal axis rotator (5247) Krylov", *Astronomy and Astrophysics*, Vol. 635, Number A137, p. A137 (2020)

DOI: 10.1051/0004-6361/201936808

141 Levin N., Kyba C.C.M., Zhang Q., Sánchez de Miguel A., Román M.O., Li X., Portnov B.A., Molthan A.L., Jechow A., Miller S.D., Wang Z., Shrestha R.M., Elvidge C.D.

"Remote sensing of night lights: A review and an outlook for the future", *Remote Sensing of Environment*, Vol. 237, Number 111443 (2020)

DOI: 10.1016/j.rse.2019.111443

142 Lewis T.R., Martín J.C.G., Blitz M.A., Cuevas C.A., Plane J.M.C., Saiz-Lopez A.

"Determination of the absorption cross sections of higher-order iodine oxides at 355 and 532 nm", *Atmospheric Chemistry and Physics*, Vol. 20, p. 10865-10887 (2020)

DOI: 10.5194/acp-20-10865-2020

143 Li D., Liu F., Pérez-Invernón F.J., Lu G., Qin Z., Zhu B., Luque A.

"On the Accuracy of Ray-Theory Methods to Determine the Altitudes of Intracloud Electric Discharges and Ionospheric Reflections: Application to Narrow Bipolar Events", *Journal of Geophysical Research D: Atmospheres,* Vol. 125, Number e2019JD032099, p. e32099 (2020)

DOI: 10.1029/2019JD032099

144 Li Z., Menzel W.P., Jung J., Lim A., Li J., Matricardi M., López-Puertas M., DeSouza-Machado S., Strow L.L.

"Improving the Understanding of CrIS Full Spectral Resolution Nonlocal Thermodynamic Equilibrium Radiances Using Spectral Correlation", *Journal of Geophysical Research D: Atmospheres*, Vol. 125, Number e2020JD032710, p. e32710 (2020)

DOI: 10.1029/2020JD032710

145 Lico, R.; Liu, J.; Giroletti, M.; Orienti, M.; Gómez, J. L.; Piner, B. G.; MacDonald, N. R.; D'Ammando, F.; Fuentes, A.

"A parsec-scale wobbling jet in the high-synchrotron peaked blazar PG 1553+113", *Astronomy and Astrophysics*, Vol. 634, p. A87 (2020)

DOI: 10.1051/0004-6361/201936564

146 Lin L. *et al.* (includes Castro-Tirado A.J., Hu Y.D.,)

"No pulsed radio emission during a bursting phase of a Galactic magnetar", *Nature*, Vol. 587, p. 63-65 (2020)

DOI: 10.1038/s41586-020-2839-y

147 Lin, Sicheng; Tinker, Jeremy L.; Klypin, Anatoly; Prada, Francisco; Blanton, Michael R.; Comparat, Johan; Dawson, Kyle S.; de Mattia, Arnaud; du Mas des Bourboux, Hélion; Percival, Will J.; Raichoor, Anand; Rossi, Graziano; Smith, Alex; Zhao, Cheng

"The Completed SDSS-IV Extended Baryon Oscillation Spectroscopic Survey: GLAM-QPM mock galaxy catalogs for the Emission Line Galaxy Sample", *Monthly Notices of the Royal Astronomical Society*, p. 5251-5262 (2020)

DOI: 10.1093/mnras/staa2571

148 Liu J., Zheng Z., Soria R., Aceituno J., Zhang H., Lu Y., Wang S., Hamann W.-R., Oskinova L.M., Ramachandran V., Yuan H., Bai Z., Wang S., McKee B.J., Wu J., Wang J., Lattanzi M., Belczynski K., Casares J., Hernandez J.I.G., Rebolo R.

"Phase-dependent Study of Near-infrared Disk Emission Lines in LB-1", *Astrophysical Journal*, Vol. 900, Number 42 (2020)

DOI: 10.3847/1538-4357/aba49e

149 Liuzzi G., Villanueva G.L., Crismani M.M.J., Smith M.D., Mumma M.J., Daerden F., Aoki S., Vandaele A.C., Clancy R.T., Erwin J., Thomas I., Ristic B., Lopez-Moreno J.-J., Bellucci G., Patel M.R.

"Strong Variability of Martian Water Ice Clouds During Dust Storms Revealed From ExoMars Trace Gas Orbiter/NOMAD", *Journal of Geophysical Research E: Planets,* Vol. 125, Number e2019JE006250, p. e06250 (2020)

DOI: 10.1029/2019JE006250

150 López-González M.J., García-Comas M., Rodríguez E., López-Puertas M., Olivares I., Jerónimo-Zafra J.M., Robles-Muñoz N.F., Pérez-Silvente T., Shepherd M.G., Shepherd G.G., Sargoytchev S.

"Gravity wave activity in the middle atmosphere from SATI airglow observations at northern mid-latitude: Seasonal variation and comparison with tidal and planetary wave-like activity", Journal of Atmospheric and Solar-Terrestrial Physics, Vol. 206, Number 105329, p. 105329 (2020)

DOI: 10.1016/j.jastp.2020.105329

151 López-Ruiz, F. F.; Guerrero, J.; Aldaya, V.

"Proper scalar product for tachyon representations in configuration space", *Physical Review D - Particles, Fields, Gravitation and Cosmology*, Vol. 102, p. 125010 (2020)

DOI: 10.1103/PhysRevD.102.125010

152 Lorenzo-Gutiérrez, A.; Alfaro, E. J.; Maíz Apellániz, J.; Barbá, R. H.; Marín-Franch, A.; Ederoclite, A.; Cristóbal-Hornillos, D.; Varela, J.; Vázquez Ramió, H.; Cenarro, A. J.; Lennon, D. J.; García-Lario, P.; Daflon, S.; Borges Fernandes, M.

"Deriving stellar parameters from GALANTE photometry: bias and precision", *Monthly Notices of the Royal Astronomical Society*, Vol. 494, p. 3342 (2020)

DOI: 10.1093/mnras/staa892

153 Lu, Gaopeng; Xiong, Shaoling; Lyu, Fanchao; Zhang, Hongbo; Xu, Wei; Yang, Jing; Zhu, Baoyou; Liu, Feifan; Li, Dongshuai

"Terrestrial gamma-ray flashes as the high-energy effect of tropospheric thunderstorms in near-Earth space", *Scientia Sinica: Physica, Mechanica et Astronomica*, Vol. 50, Number 129506 (2020)

DOI: 10.1360/SSPMA-2020-0303

154 Lundqvist, Peter; Kundu, Esha; Pérez-Torres, Miguel A.; Ryder, Stuart D.; Björnsson, Claes-Ingvar; Moldon, Javier; Argo, Megan K.; Beswick, Robert J.; Alberdi, Antxon; Kool, Erik C.

"The Deepest Radio Observations of Nearby SNe Ia: Constraining Progenitor Types and Optimizing Future Surveys", *Astrophysical Journal*, Vol. 890, p. 159 (2020)

DOI: 10.3847/1538-4357/ab6dc6

155 Luque A., Gordillo-Vázquez F., Li D., Malagón-Romero A., Pérez-Invernón F.J., Schmalzried A., Soler S., Chanrion O., Heumesser M., Neubert T., Reglero V., Østgaard N.

"Modeling lightning observations from space-based platforms (CloudScat.jl 1.0)", *Geoscientific Model Development*, Vol. 13, p. 5549-5566 (2020)

DOI: 10.5194/gmd-13-5549-2020

156 Maciejewski, G.; Fernández, M.; Sota, A.; García Segura, A. J.

"A Newtonian Model for the WASP-148 Exoplanetary System Enhanced with TESS and Ground-based Photometric Observations", *Acta Astronómica*, Vol. 70, Issue 3, p. 203-217 (2020)

DOI: 10.32023/0001-5237/70.3.3

157 Mahatma, Vijay H.; Hardcastle, Martin J.; Croston, Judith H.; Harwood, Jeremy; Ineson, Judith; Moldon, Javier

"Investigating the spectral age problem with powerful radio galaxies", *Monthly Notices of the Royal Astronomical Society*, Vol. 491, p. 5015-5034 (2020)

DOI: 10.1093/mnras/stz3396

158 Maíz Apellániz J., Crespo Bellido P., Barbá R.H., Fernández Aranda R., Sota A.

"The Villafranca catalog of Galactic OB groups: I. Systems with O2-O3.5 stars", *Astronomy and Astrophysics*, Vol. 643, Number 38228, p. A138 (2020)

DOI: 10.1051/0004-6361/202038228

159 Malagón-Romero A., Teunissen J., Stenbaek-Nielsen H.C., McHarg M.G., Ebert U., Luque A.

"On the Emergence Mechanism of Carrot Sprites", *Geophysical Research Letters*, Vol. 47, Number e2019GL085776, p. e85776 (2020)

DOI: 10.1029/2019GL085776

160 Marfil, E.; Tabernero, H. M.; Montes, D.; Caballero, J. A.; Soto, M. G.; González Hernández, J. I.; Kaminski, A.; Nagel, E.; Jeffers, S. V.; Reiners, A.; Ribas, I.; Quirrenbach, A.; Amado, P. J.

"Stellar atmospheric parameters of FGK-type stars from high-resolution optical and near-infrared CARMENES spectra", *Monthly Notices of the Royal Astronomical Society*, Vol. 492, Issue 4, p. 5470-5507 (2020)

DOI: 10.1093/mnras/staa058

161 Marti-Vidal I., Muller S., Mus A., Marscher A., Agudo I., Gomez J.L.

"ALMA full polarization observations of PKS 1830-211 during its record-breaking flare of 2019", *Astronomy and Astrophysics*, Vol. 638, Number L13, p. L13 (2020)

DOI: 10.1051/0004-6361/202038094

162 Martín J.C.G., Guirado D., Zubko E., Escobar-Cerezo J., Moreno F., Muñoz O.

"Computational study of the sensitivity of laser light scattering particle sizing to refractive index and irregularity", *Journal of Quantitative Spectroscopy and Radiative Transfer,* Vol. 241, Number 106745, p. 106745 (2020)

DOI: 10.1016/j.jqsrt.2019.106745

163 Marton G., Kiss C., Molnár L., Pál A., Farkas-Takács A., Szabó G.M., Müller T., Ali-Lagoa V., Szabó R., Vinkó J., Sárneczky K., Kalup C.E., Marciniak A., Duffard R., Kiss L.L.

"Light curves of ten Centaurs from K2 measurements", *Icarus*, Vol. 345, Number 113721, p. 113721 (2020)

DOI: 10.1016/j.*icarus*.2020.113721

164 Marziani, P.; Bon, E.; Bon, N.; Martinez-Aldama, M. L.; Stirpe, G. M.; D'Onofrio, M.; del Olmo, A.; Negrete, C. A.; Dultzin, D.

"Quasar emission lines as virial luminosity estimators", *Contributions of the Astronomical Observatory Skalnate Pleso*, Vol. 50, p. 244-256 (2020)

DOI: 10.31577/caosp.2020.50.1.244

165 Marziani, Paola; del Olmo, Ascension; Perea, Jaime; D'Onofrio, Mauro; Panda, Swayamtrupta

" Broad UV Emission Lines in Type-1 Active Galactic Nuclei: A Note on Spectral Diagnostics and the Excitation Mechanism", *Atoms*, Vol. 8, Issue 4, p. 94 (2020)

DOI: 10.3390/atoms8040094

166 Massana, Pol *et al.* (includes Martínez-Delgado, D.)

"SMASHing the low surface brightness SMC", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. 1034-1049 (2020)

DOI: 10.1093/mnras/staa2451

167 Maund, J. R.; Leloudas, G.; Malesani, D. B.; Patat, F.; Sollerman, J.; de Ugarte Postigo, A.

"Polarimetry of the superluminous transient ASASSN-15lh", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. 3730-3735 (2020)

DOI: 10.1093/mnras/staa2517

168 Mayya, Y. D. *et al.* (includes Iglesias-Páramo, J.)

"MEGARA-IFU detection of extended He II λ4686 nebular emission in the central region of NGC 1569 and its ionization budget", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. 1496 (2020)

DOI: 10.1093/mnras/staa2335

169 Mejía-Narváez, A.; Sánchez, S. F.; Lacerda, E. A. D.; Carigi, L.; Galbany, L.; Husemann, B.; García-Benito, R.

"The stellar metallicity distribution function of galaxies in the CALIFA survey", *Monthly Notices of the Royal Astronomical Society*, p. 4838-4853 (2020)

DOI: 10.1093/mnras/staa3094

170 Michałowski, Michał J.; Thöne, Christina; de Ugarte Postigo, Antonio; Hjorth, Jens; Leśniewska, Aleksandra; Gotkiewicz, Natalia; Dimitrov, Wojciech; Koprowski, Maciej P.; Kamphuis, Peter

"NGC 2770: High supernova rate due to interaction", *Astronomy and Astrophysics*, Vol. 642, p. A84 (2020)

DOI: 10.1051/0004-6361/202038719

171 Milić, I.; Gafeira, R.

"Mimicking spectropolarimetric inversions using convolutional neural networks", *Astronomy and Astrophysics*, Vol. 644, Number A129 (2020)

DOI: 10.1051/0004-6361/201936537

172 Molaro, P.; Izzo, L.; Bonifacio, P.; Hernanz, M.; Selvelli, P.; della Valle, M.

"Search for 7Be in the outbursts of four recent novae", *Monthly Notices of the Royal Astronomical Society*, Vol. 492, p. 4975 (2020)

DOI: 10.1093/mnras/stz3587

173 Molino, A. *et al.* (includes Benítez, N.)

"Assessing the photometric redshift precision of the S-PLUS survey: the Stripe-82 as a test-case.", *Monthly Notices of the Royal Astronomical Society*, p. 3884-3908 (2020)

DOI: 10.1093/mnras/staa1586

174 Montes, Mireia; Infante-Sainz, Raúl; Madrigal-Aguado, Alberto; Román, Javier; Monelli, Matteo; Borlaff, Alejandro S.; Trujillo, Ignacio

"The Galaxy 'Missing Dark Matter' NGC 1052-DF4 is Undergoing Tidal Disruption", *Astrophysical Journal*, Vol. 904, p. 114 (2020)

DOI: 10.3847/1538-4357/abc340

175 Morello, G.; Claret, A.; Martin-Lagarde, M.; Cossou, C.; Tsiaras, A.; Lagage, P. -O.

"The ExoTETHyS Package: Tools for Exoplanetary Transits around Host Stars", *Astronomical Journal*, Vol. 159, p. 75 (2020)

DOI: 10.3847/1538-3881/ab63dc

176 Morello, Giuseppe; Claret, Antonio; Martin-Lagarde, Marine; Cossou, Christophe; Tsiara, Angelos; Lagage, Pierre-Olivier

"ExoTETHyS: Tools for Exoplanetary Transits around host stars", *The Journal of Open Source Software*, Vol. 5, p. 1834 (2020)

DOI: 10.21105/joss.01834

177 Mosenkov, Aleksandr; Rich, R. Michael; Koch, Andreas; Brosch, Noah; Thilker, David; Román, Javier; Müller, Oliver; Smirnov, Anton; Usachev, Pavel

"The Halos and Environments of Nearby Galaxies (HERON) II: The outer structure of edge-on galaxies", *Monthly Notices of the Royal Astronomical Society*, p. 1751 (2020)

DOI: 10.1093/mnras/staa678

178 Müller, D. *et al.* (includes del Toro Iniesta, J. C.)

"The Solar Orbiter mission. Science overview", *Astronomy and Astrophysics*, Vol. 642, p. A1 (2020)

DOI: 10.1051/0004-6361/202038467

179 Muñoz, O.; Moreno, F.; Gómez-Martín, J. C.; Vargas-Martín, F.; Guirado, D.; Ramos, J. L.; Bustamante, I.; Bertini, I.; Frattin, E.; Markannen, J.; Tubiana, C.; Fulle, M.; Güttler, C.; Sierks, H.; Rotundi, A.; Corte, V. Della; Ivanovski, S.; Zakharov, V. V.; Bockelée-Morvan, D.; Blum, J.; Merouane, S.; Levasseur-Regourd, A. C.; Kolokolova, L.; Jardiel, T.; Caballero, A. C.

"Experimental Phase Function and Degree of Linear Polarization Curves of Millimeter-sized Cosmic Dust Analogs", *Astrophysical Journal* Supplement Series, Vol. 247, p. 19 (2020)

DOI: 10.3847/1538-4365/ab6851

180 Muxlow, T. W. B. *et al.* (includes Pérez-Torres, M. A.)

"The e-MERGE Survey (e-MERLIN Galaxy Evolution Survey): overview and survey description", *Monthly Notices of the Royal Astronomical Society*, Vol. 495, p. 1188 (2020)

DOI: 10.1093/mnras/staa1279

181 Nadolny J., Lara-López M.A., Cerviño M., Bongiovanni Á., Cepa J., De Diego J.A., Pérez García A.M., Pérez Martínez R., Sánchez-Portal M., Alfaro E., Castañeda H.O., Gallego J., González J.J., González-Serrano J.I., Padilla Torres C.P., Pintos-Castro I., Pović M.

"The OTELO survey: Nature and mass-metallicity relation for H Ð emitters at z Ð0.4", *Astronomy and Astrophysics*, Vol. 636, Number A84, p. A84 (2020)

DOI: 10.1051/0004-6361/201936205

182 Nilsson, K.; Kotilainen, J.; Valtonen, M.; Gomez, J. L.; Castro-Tirado, A. J.; Drozdz, M.; Gopakumar, A.; Jeong, S.; Kidger, M.; Komossa, S.; Mathur, S.; Park, I. H.; Reichart, D. E.; Zola, S.

"The Host Galaxy of OJ 287 Revealed by Optical and Near-infrared Imaging", *Astrophysical Journal*, Vol. 904, p. 102 (2020)

DOI: 10.3847/1538-4357/abbda1

183 Nishikawa, Kenichi; Mizuno, Yosuke; Gómez, Jose L.; DuĐan, Ioana; Niemiec, Jacek; Kobzar, Oleh; MacDonald, Nicholas; Meli, Athina; Pohl, Martin; Hirotani, Kouichi

"Rapid Particle Acceleration due to Recollimation Shocks and Turbulent Magnetic Fields in Injected Jets with Helical Magnetic Fields", *Monthly Notices of the Royal Astronomical Society*, p. 2652 (2020)

DOI: 10.1093/mnras/staa421

184 Nogueras-Lara, F.; Schödel, R.; Neumayer, N.; Gallego-Cano, E.; Shahzamanian, B.; Gallego-Calvente, A. T.; Najarro, F.

"GALACTIC NUCLEUS: A high angular-resolution JHKs imaging survey of the Galactic centre. III. Evidence for wavelength-dependence of the extinction curve in the near-infrared", *Astronomy and Astrophysics*, Vol. 641, p. A141 (2020)

DOI: 10.1051/0004-6361/202038606

185 Nogueras-Lara, Francisco; Schödel, Rainer; Gallego-Calvente, Aurelia Teresa; Gallego-Cano, Eulalia; Shahzamanian, Banafsheh; Dong, Hui; Neumayer, Nadine; Hilker, Michael; Najarro, Francisco; Nishiyama, Shogo; Feldmeier-Krause, Anja; Girard, Julien H. V.; Cassisi, Santi

"Early formation and recent starburst activity in the nuclear disk of the Milky Way", Nature Astronomy, Vol. 4, Issue 4, p. 377-381 (2020)

DOI: 10.1038/s41550-019-0967-9

186 Nowak, G. *et al.* (includes Rodríguez-López, C.; Aceituno, F. J.; Amado, P. J.; Bauer, F. F.)

"The CARMENES search for exoplanets around M dwarfs. Two planets on opposite sides of the radius gap transiting the nearby M dwarf LTT 3780", *Astronomy and Astrophysics*, Vol. 642, p. A173 (2020)

DOI: 10.1051/0004-6361/202037867

187 Ortiz J.L., *et al.* (includes Santos-Sanz P., Duffard R., Morales N., Vara-Lubiano M., Gutiérrez P.J., Madiedo J.M.)

"The large trans-Neptunian object 2002 TC302from combined stellar occultation, photometry, and astrometry data", *Astronomy and Astrophysics*, Vol. 639, p. A134 (2020)

DOI: 10.1051/0004-6361/202038046

188 Oshagh M., Bauer F.F., Lafarga M., Molaverdikhani K., Amado P.J., Nortmann L., Reiners A., Guzmán-Mesa A., Pallé E., Nagel E., Caballero J.A., Casasayas-Barris N., Claret A., Czesla S., Galadí D., Henning T., Khalafinejad S., López-Puertas M., Montes D., Quirrenbach A., Ribas I., Stangret M., Yan F., Zapatero Osorio M.R., Zechmeister M.

"The widest broadband transmission spectrum (0.38-1.71 μ m) of HD 189733b from ground-based chromatic Rossiter-McLaughlin observations", *Astronomy and Astrophysics*, Vol. 643, Number A64, p. A64 (2020)

DOI: 10.1051/0004-6361/202039213

189 Osorio-Clavijo, N.; González-Martín, O.; Papadakis, I. E.; Masegosa, J.; Hernández-García, L.

"The inner view of NGC 1052 using multiple X-ray observations", *Monthly Notices of the Royal Astronomical Society*, Vol. 491, p. 29-38 (2020)

DOI: 10.1093/mnras/stz2785

190 Palacios, Judith; Utz, Dominik; Hofmeister, Stefan; Krikova, Kilian; Gömöry, Peter; Kuckein, Christoph; Denker, Carsten; Verma, Meetu; González Manrique, Sergio Javier; Campos Rozo, Jose Iván; Koza, Július; Temmer, Manuela; Veronig, Astrid; Diercke, Andrea; Kontogiannis, Ioannis; Cid, Consuelo

"Magnetic Flux Emergence in a Coronal Hole", *Solar Physics*, Vol. 295, p. 64 (2020)

DOI: 10.1007/s11207-020-01629-9

191 Paliya V.S., Pérez E., Garciá-Benito R., Ajello M., Prada F., Alberdi A., Suh H., Chandra C.H.I., Domínguez A., Marchesi S., Matteo T.D., Hartmann D., Chiaberge M.

"TXS 2116-077: A Gamma-Ray Emitting Relativistic Jet Hosted in a Galaxy Merger", *Astrophysical Journal*, Vol. 892, Number 133, p. 133 (2020)

DOI: 10.3847/1538-4357/ab754f

192 Palle, E. *et al.* (includes Lampón, M.; López-Puertas, M.; Lara, L. M.; Amado, P. J. and Sánchez-López, A.)

"A He I upper atmosphere around the warm Neptune GJ 3470 b", *Astronomy and Astrophysics*, Vol. 638, p. A61 (2020)

DOI: 10.1051/0004-6361/202037719

193 Passegger, V. M. *et al.* (includes Amado, P. J. and Bauer, F. F.)

"The CARMENES search for exoplanets around M dwarfs. A deep learning approach to determine fundamental parameters of target stars", *Astronomy and Astrophysics*, Vol. 642, p. A22 (2020)

DOI: 10.1051/0004-6361/202038787

194 Pereira-Santaella, M.; Colina, L.; García-Burillo, S.; González-Alfonso, E.; Alonso-Herrero, A.; Arribas, S.; Cazzoli, S.; Piqueras-López, J.; Rigopoulou, D.; Usero, A.

"Excitation and acceleration of molecular outflows in LIRGs: The extended ESO 320-G030 outflow on 200-pc scales", *Astronomy and Astrophysics*, Vol. 643, p. A89 (2020)

DOI: 10.1051/0004-6361/202038838

195 Pérez-Invernón F.J., Malagón-Romero A., Gordillo-Vázquez F.J., Luque A.

"The Contribution of Sprite Streamers to the Chemical Composition of the Mesosphere-Lower Thermosphere", *Geophysical Research Letters*, Vol. 47, Number e2020GL088578, p. e88578 (2020)

DOI: 10.1029/2020GL088578

196 Pérez-Montero, E.; Kehrig, C.; Vílchez, J. M.; García-Benito, R.; Duarte Puertas, S.; Iglesias-Páramo, J.

"Photon leaking or very hard ionizing radiation? Unveiling the nature of He II-emitters using the softness diagram", *Astronomy and Astrophysics*, Vol. 643, p. A80 (2020)

DOI: 10.1051/0004-6361/202038509

197 Perna, M.; Arribas, S.; Catalán-Torrecilla, C.; Colina, L.; Bellocchi, E.; Fluetsch, A.; Maiolino, R.; Cazzoli, S.; Hernán Caballero, A.; Pereira Santaella, M.; Piqueras López, J.; Rodríguez del Pino, B.

"MUSE view of Arp220: Kpc-scale multi-phase outflow and evidence for positive feedback", *Astronomy and Astrophysics*, Vol. 643, p. A139 (2020)

DOI: 10.1051/0004-6361/202038328

198 Pilyugin, L. S.; Grebel, E. K.; Zinchenko, I. A.; Vílchez, J. M.; Sakhibov, F.; Nefedyev, Y. A.; Berczik, P. P.

"Properties of galaxies with an offset between the position angles of the major kinematic and photometric axes", *Astronomy and Astrophysics*, Vol. 634, p. A26 (2020)

DOI: 10.1051/0004-6361/201936357

199 Podlewska-Gaca, E. *et al.* (includes Duffard, R.; Morales, N.)

"Physical parameters of selected Gaia mass asteroids", *Astronomy and Astrophysics*, Vol. 638, p. A11 (2020)

DOI: 10.1051/0004-6361/201936380

200 Pozuelos, Francisco J.; Suárez, Juan C.; de Elía, Gonzalo C.; Berdiñas, Zaira M.; Bonfanti, Andrea; Dugaro, Agustín; Gillon, Michaël; Jehin, Emmanuël; Günther, Maximilian N.; Van Grootel, Valérie; Garcia, Lionel J.; Thuillier, Antoine; Delrez, Laetitia; Rodón, Jose R.

"GJ 273: on the formation, dynamical evolution, and habitability of a planetary system hosted by an M dwarf at 3.75 parsec", *Astronomy and Astrophysics*, Vol. 641, p. A23 (2020)

DOI: 10.1051/0004-6361/202038047

201 Privon G.C., Ricci C., Aalto S., Viti S., Armus L., Díaz-Santos T., González-Alfonso E., Iwasawa K., Jeff D.L., Treister E., Bauer F., Evans A.S., Garg P., Herrero-Illana R., Mazzarella J.M., Larson K., Blecha L., Barcos-Muoz L., Charmandaris V., Stierwalt S., Pérez-Torres M.A.

"A hard x-ray test of hcn enhancements as a tracer of embedded black hole growth", *Astrophysical Journal*, Vol. 893, Number 149, p. 149 (2020)

DOI: 10.3847/1538-4357/ab8015

202 Psaltis D., *et al.* (includes Alberdi A., Gómez J.L., Lico R.)

"Gravitational Test beyond the First Post-Newtonian Order with the Shadow of the M87 Black Hole", Physical Review Letters, Vol. 125, Number 141104, p. 141104 (2020)

DOI: 10.1103/PhysRevLett.125.141104

203 Qiao, Hai-Hua; Breen, Shari L.; Gómez, José F.; Dawson, J. R.; Walsh, Andrew J.; Green, James A.; Ellingsen, Simon P.; Imai, Hiroshi; Shen, Zhi-Qiang

"Accurate OH Maser Positions from the SPLASH Survey. III. The Final 96 deg2", *Astrophysical Journal* Supplement Series, Vol. 247, p. 5 (2020)

DOI: 10.3847/1538-4365/ab655d

204 Ramambason, L.; Schaerer, D.; Stasińska, G.; Izotov, Y. I.; Guseva, N. G.; Vílchez, J. M.; Amorín, R.; Morisset, C.

"Reconciling escape fractions and observed line emission in Lyman-continuum-leaking galaxies", *Astronomy and Astrophysics*, Vol. 644, p. A21 (2020)

DOI: 10.1051/0004-6361/202038634

205 Rampazzo, R.; Omizzolo, A.; Uslenghi, M.; Román, J.; Mazzei, P.; Verdes-Montenegro, L.; Marino, A.; Jones, M. G.

"Morphology and surface photometry of a sample of isolated early-type galaxies from deep imaging", *Astronomy and Astrophysics*, Vol. 640, p. A38 (2020)

DOI: 10.1051/0004-6361/202038156

206 Rampazzo, Roberto; Uslenghi, Michela; Georgiev, Iskren Y.; Cattapan, Arianna; Verdes-Montenegro, Lourdes; Bonaglia, Marco; Borelli, Jose Luis; Busoni, Lorenzo; Gäessler, Wolfgang; Magrin, Demetrio; Marino, Antonina; Mazzei, Paola; Mazzoni, Tommaso; Peter, Diethard; Rabien, Sebastian; Ragazzoni, Roberto; Rosensteiner, Mathias

"High-resolution morphology and surface photometry of KIG 685 and KIG 895 with ARGOS+LUCI using the Large Binocular Telescope", *Astronomische Nachrichten*, Vol. 341, Issue 1, p. 10-25 (2020)

DOI: 10.1002/asna.201913633

207 Rechy-García J.S., Guerrero M.A., Santamaría E., Gómez-González V.M.A., Ramos-Larios G., Toalá J.A., Cazzoli S., Sabin L., Miranda L.F., Fang X., Liu J.

"Discovery of a Fast-expanding Shell in the Inside-out Born-again Planetary Nebula HuBi 1 through High-dispersion Integral Field Spectroscopy", *Astrophysical Journal* Letters, Vol. 903, Number L4, p. L4 (2020)

DOI: 10.3847/2041-8213/abbe22

208 Rechy-García, J. S.; Guerrero, M. A.; Duarte Puertas, S.; Chu, Y. -H.; Toalá, J. A.; Miranda, L. F.

"Kinematical investigation of possible fast collimated outflows in twelve planetary nebulae", *Monthly Notices of the Royal Astronomical Society*, Vol. 492, p. 1957-1969 (2020)

DOI: 10.1093/mnras/stz3326

209 Relaño M., Lisenfeld U., Hou K.-C., De Looze I., Vílchez J.M., Kennicutt R.C.

"Evolution of grain size distribution in galactic discs", *Astronomy and Astrophysics*, Vol. 636, Number A18, p. A18 (2020)

DOI: 10.1051/0004-6361/201937087

210 Rivière-Marichalar, P.; Fuente, A.; Le Gal, R.; Baruteau, C.; Neri, R.; Navarro-Almaida, D.; Treviño-Morales, S. P.; Macías, E.; Bachiller, R.; Osorio, M.

"AB Aur, a Rosetta stone for studies of planet formation. I. Chemical study of a planet-forming disk", *Astronomy and Astrophysics*, Vol. 642, p. A32 (2020)

DOI: 10.1051/0004-6361/202038549

211 Roche P.F., Lopez-Rodriguez E., Telesco C.M., Schödel R., Packham C.

"High resolution imaging of the magnetic field in the central parsec of the Galaxy", Planetary and Space Science, Vol. 183, Number 104578, p. 104578 (2020)

DOI: 10.1016/j.pss.2018.07.007

212 Rodríguez, E.; Balona, L. A.; López-González, M. J.; Ocando, S.; Martín-Ruiz, S.; Rodríguez-López, C.

"Pulsation and rotation in NGC 6811: the Kepler short-cadence stars", *Monthly Notices of the Royal Astronomical Society*, Vol. 491, p. 4345 (2020)

DOI: 10.1093/mnras/stz3143

213 Rodríguez-Kamenetzky, A.; Carrasco-González, C.; Torrelles, J. M.; Vlemmings, W. H. T.; Rodríguez, L. F.; Surcis, G.; Gómez, J. F.; Cantó, J.; Goddi, C.; Kim, J. S.; Kim, S. -W.; Añez-López, N.; Curiel, S.; van Langevelde, H. J.

"Characterizing the radio continuum nature of sources in the massive star-forming region W75N (B)", *Monthly Notices of the Royal Astronomical Society*, Vol. 496, p. 3128 (2020)

DOI: 10.1093/mnras/staa1742

214 Rodríguez-Martín, J. E.; García Hernández, A.; Suárez, J. C.; Rodón, J. R.

"Study of the low-order Δv-{\bar{\ rho }} relation for moderately-rotating δ Scuti stars and its impact on their characterisation", *Monthly Notices of the Royal Astronomical Society*, p. 1700-1709 (2020)

DOI: 10.1093/mnras/staa2378

215 Roelofs F. *et al.* (includes Alberdi A., Gómez J.L.)

"SYMBA: An end-to-end VLBI synthetic data generation pipeline: Simulating Event Horizon Telescope observations of M 87", *Astronomy and Astrophysics*, Vol. 636, Number A5, p. A5 (2020)

DOI: 10.1051/0004-6361/201936622

216 Román, Javier; Trujillo, Ignacio; Montes, Mireia

"Galactic cirri in deep optical imaging", *Astronomy and Astrophysics*, Vol. 644, p. A42 (2020)

DOI: 10.1051/0004-6361/201936111

217 Rommel, F. L. *et al.* (includes Ortiz, J. L.; Santos-Sanz, P.; Duffard, R.; Morales, N.)

"Stellar occultations enable milliarcsecond astrometry for Trans-Neptunian objects and Centaurs", *Astronomy and Astrophysics*, Vol. 644, p. A40 (2020)

DOI: 10.1051/0004-6361/202039054

218 Rossi, A.; Stratta, G.; Maiorano, E.; Spighi, D.; Masetti, N.; Palazzi, E.; Gardini, A.; Melandri, A.; Nicastro, L.; Pian, E.; Branchesi, M.; Dadina, M.; Testa, V.; Brocato, S.; Benetti, S.; Ciolfi, R.; Covino, S.; D'Elia, V.; Grado, A.; Izzo, L.; Perego, A.; Piranomonte, S.; Salvaterra, R.; Selsing, J.; Tomasella, L.; Yang, S.; Vergani, D.; Amati, L.; Stephen, J. B.

"A comparison between short GRB afterglows and kilonova AT2017gfo: shedding light on kilonovae properties", *Monthly Notices of the Royal Astronomical Society*, p. 3379-3397 (2020)

DOI: 10.1093/mnras/staa479

219 Rouillard, A. P. *et al.* (includes Bellot Rubio, L.; Orozco Suarez, D.; del Toro Iniesta, J. C.)

"Models and data analysis tools for the Solar Orbiter mission", *Astronomy and Astrophysics*, Vol. 642, p. A2 (2020)

DOI: 10.1051/0004-6361/201935305

220 Rubio, G.; Toalá, J. A.; Jiménez-Hernández, P.; Ramos-Larios, G.; Guerrero, M. A.; Gómez-González, V. M. A.; Santamarí, A. E.; Quino-Mendoza, J. A.

"Unveiling the stellar origin of the Wolf-Rayet nebula NGC 6888 through infrared observations", *Monthly Notices of the Royal Astronomical Society*, p. 415 (2020)

DOI: 10.1093/mnras/staa2837

221 Ruiz-Lara T., Gallart C., Monelli M., Nidever D., Dorta A., Choi Y., Olsen K., Besla G., Bernard E.J., Cassisi S., Massana P., Noël N.E.D., Pérez I., Rusakov V., Cioni M.-R.L., Majewski S.R., Van Der Marel R.P., Martínez-Delgado D., Monachesi A., Monteagudo L., Muñoz R.R., Stringfellow G.S., Surot F., Vivas A.K., Walker A.R., Zaritsky D.

"The Large Magellanic Cloud stellar content with SMASH: I. Assessing the stability of the Magellanic spiral arms", *Astronomy and Astrophysics*, Vol. 639, Number L3, p. L3 (2020)

DOI: 10.1051/0004-6361/202038392

222 Sanchez de Miguel A., Kyba C.C.M., Zamorano J., Gallego J., Gaston K.J.

"The nature of the diffuse light near cities detected in nighttime satellite imagery", Scientific Reports, Vol. 10, Number 7829, p. 7829 (2020)

DOI: 10.1038/s41598-020-64673-2

223 Sánchez, Néstor; Alfaro, Emilio J.; López-Martínez, Fátima

"A catalogue of open cluster radii determined from Gaia proper motions", *Monthly Notices of the Royal Astronomical Society*, p. 2882-2893 (2020)

DOI: 10.1093/mnras/staa1359

224 Sánchez-López A., López-Puertas M., Snellen I.A.G., Nagel E., Bauer F.F., Pallé E., Tal-Or L., Amado P.J., Caballero J.A., Czesla S., Nortmann L., Reiners A., Ribas I., Quirrenbach A., Aceituno J., Béjar V.J.S., Casasayas-Barris N., Henning T., Molaverdikhani K., Montes D., Stangret M., Zapatero Osorio M.R., Zechmeister M.

"Discriminating between hazy and clear hot-Jupiter atmospheres with CARMENES", *Astronomy and Astrophysics*, Vol. 643, Number A24, p. A24 (2020)

DOI: 10.1051/0004-6361/202038629

225 Santamariá E., Guerrero M.A., Ramos-Larios G., Toalá J.A., Sabin L., Rubio G., Quino-Mendoza J.A.

"Angular Expansion of Nova Shells", *Astrophysical Journal*, Vol. 892, Number 60, p. 60 (2020)

DOI: 10.3847/1538-4357/ab76c5

226 Schmalzried A., Luque A.

"Influence of Elastic Scattering on Electron Swarm Distribution in Electrified Gases", *Journal of Geophysical Research D: Atmospheres*, Vol. 125, Number e2019JD031564, p. e31564 (2020)

DOI: 10.1029/2019JD031564

227 Schneider N.M., Milby Z., Jain S.K., González-Galindo F., Royer E., Gérard J.-C., Stiepen A., Deighan J., Stewart A.I.F., Forget F., Lefèvre F., Bougher S.W.

"Imaging of Martian Circulation Patterns and Atmospheric Tides Through MAVEN/IUVS Nightglow Observations", *Journal of Geophysical Research A: Space Physics,* Vol. 125, Number e2019JA027318, p. e27318 (2020)

DOI: 10.1029/2019JA027318

228 Schödel, R.; Nogueras-Lara, F.; Gallego-Cano, E.; Shahzamanian, B.; Gallego-Calvente, A. T.; Gardini, A.

"The Milky Way's nuclear star cluster: Old, metal-rich, and cuspy. Structure and star formation history from deep imaging", *Astronomy and Astrophysics*, Vol. 641, p. A102 (2020)

DOI: 10.1051/0004-6361/201936688

229 Schulz, R.; Kadler, M.; Ros, E.; Perucho, M.; Krichbaum, T. P.; Agudo, I.; Beuchert, T.; Lindqvist, M.; Mannheim, K.; Wilms, J.; Zensus, J. A.

"Sub-milliarcsecond imaging of a bright flare and ejection event in the extragalactic jet 3C 111", *Astronomy and Astrophysics*, Vol. 644, Number A85, p. A85 (2020)

DOI: 10.1051/0004-6361/202037737

230 Sepúlveda, Inma; Estalella, Robert; Anglada, Guillem; López, Rosario; Riera, Angels; Busquet, Gemma; Palau, Aina; Torrelles, José M.; Rodríguez, Luis F.

"VLA ammonia observations of L1287: Analysis of the Guitar core and two filaments", *Astronomy and Astrophysics*, Vol. 644, Number 202037895, p. A128 (2020)

DOI: 10.1051/0004-6361/202037895

231 Shulyak, D.; Lara, L. M.; Rengel, M.; Nèmec, N. -E.

"Stellar impact on disequilibrium chemistry and observed spectra of hot Jupiter atmospheres", *Astronomy and Astrophysics*, Vol. 639, p. A48 (2020)

DOI: 10.1051/0004-6361/201937210

232 Siu-Tapia, A. L.; Bellot Rubio, L. R.; Orozco Suárez, D.; Gafeira, R.

"Temporal evolution of short-lived penumbral microjets", *Astronomy and Astrophysics*, Vol. 642, p. A128 (2020)

DOI: 10.1051/0004-6361/202038370

233 Solanki, S. K. *et al.* (includes del Toro Iniesta, J. C.; Álvarez García, D.; Aparicio, B.; Balaguer Jiménez, M.; Bellot Rubio, L. R.; Cobos Carracosa, J. P.; Girela, F.; Hernández Expósito, D.; Herranz, M.; Labrousse, P.; López Jiménez, A.; Orozco Suárez, D.; Ramos, J. L.)

"The Polarimetric and Helioseismic Imager on Solar Orbiter", *Astronomy and Astrophysics*, Vol. 642, p. A11 (2020)

DOI: 10.1051/0004-6361/201935325

234 Soler S., Pérez-Invernón F.J., Gordillo-Vázquez F.J., Luque A., Li D., Malagón-Romero A., Neubert T., Chanrion O., Reglero V., Navarro-Gonzalez J., Lu G., Zhang H., Huang A., Østgaard N.

"Blue Optical Observations of Narrow Bipolar Events by ASIM Suggest Corona Streamer Activity in Thunderstorms", *Journal of Geophysical Research D: Atmospheres*, Vol. 125, Number e2020JD032708, p. e32708 (2020)

DOI: 10.1029/2020JD032708

235 Souami D., *et al.* (includes Ortiz J.L., Santos-Sanz P., Morales N., Duffard R.)

"A multi-chord stellar occultation by the large trans-Neptunian object (174567) Varda", *Astronomy and Astrophysics*, Vol. 643, Number A125, p. A125 (2020)

DOI: 10.1051/0004-6361/202038526

236 Spinoso, D. *et al.* (includes Vílchez, J. M.)

"J-PLUS: Unveiling the brightest end of the Lyα luminosity function at 2.0 < z < 3.3 over 1000 deg2", *Astronomy and Astrophysics*, Vol. 643, p. A149 (2020)

DOI: 10.1051/0004-6361/202038756

237 Sridhar, Srivatsan; Song, Yong-Seon; Ross, Ashley J.; Zhou, Rongpu; Newman, Jeffrey A.; Chuang, Chia-HSun; Blum, Robert; Gaztañaga, Enrique; Landriau, Martin; Prada, Francisco

"Clustering of LRGs in the DECaLS DR8 Footprint: Distance Constraints from Baryon Acoustic Oscillations Using Photometric Redshifts", *Astrophysical Journal*, Vol. 904, p. 69 (2020)

DOI: 10.3847/1538-4357/abc0f0

238 Stangret, M.; Casasayas-Barris, N.; Pallé, E.; Yan, F.; Sánchez-López, A.; López-Puertas, M.

"Detection of Fe I and Fe II in the atmosphere of MASCARA-2b using a cross-correlation method", *Astronomy and Astrophysics*, Vol. 638, p. A26 (2020)

DOI: 10.1051/0004-6361/202037541

239 Staub, Jan; Fernandez-Rico, German; Gandorfer, Achim; Gizon, Laurent; Hirzberger, Johann; Kraft, Stefan; Lagg, Andreas; Schou, Jesper; Solanki, Sami K.; del Toro Iniesta, Jose Carlos; Wiegelmann, Thomas; Woch, Joachim

"PMI: The Photospheric Magnetic Field Imager", Journal of Space Weather and Space Climate, Vol. 10, p. 54 (2020)

DOI: 10.1051/swsc/2020059

240 Stenbaek-Nielsen H.C., McHarg M.G., Haaland R., Luque A.

"Optical Spectra of Small-Scale Sprite Features Observed at 10,000 fps", *Journal of Geophysical Research D: Atmospheres*, Vol. 125, Number e2020JD033170, p. e33170 (2020)

DOI: 10.1029/2020JD033170

241 Stock, S. *et al.* (inclides Amado, P. J.; Bauer, F. F.; López González, M. J.; Morales, N.; Pallé, E.; Pedraz, S.; Rodríguez, E.; Rodríguez-López, C.)

"The CARMENES search for exoplanets around M dwarfs. Characterization of the nearby ultra-compact multiplanetary system YZ Ceti", *Astronomy and Astrophysics*, Vol. 636, p. A119 (2020)

DOI: 10.1051/0004-6361/201936732

242 Stock, S. *et al.* (includes Rodríguez, E.; Rodríguez-López, C.; Amado, P. J.; Bauer, F. F.; López-González, M. J.)

"The CARMENES search for exoplanets around M dwarfs. Three temperate-to-warm super-Earths", *Astronomy and Astrophysics*, Vol. 643, p. A112 (2020)

DOI: 10.1051/0004-6361/202038820

243 Suárez, Juan Carlos; Garrido, Rafael; Pascual-Granado, Javier; García Hernández, Antonio; de Franciscis, Sebastiano; Lares-Martiz, Mariel; Rodón, José R.

"Towards a new paradigm in the analysis of asteroseismic light-curves", Frontiers in Astronomy and Space Sciences, Vol. 7, p. 12 (2020)

DOI: 10.3389/fspas.2020.00012

244 Tafoya, Daniel; Imai, Hiroshi; Gómez, José F.; Nakashima, Jun-ichi; Orosz, Gabor; Yung, Bosco H. K.

"Shaping the Envelope of the Asymptotic Giant Branch Star W43A with a Collimated Fast Jet", *Astrophysical Journal*, Vol. 890, p. L14 (2020)

DOI: 10.3847/2041-8213/ab70b8

245 Tarnopolski, Mariusz; Đywucka, Natalia; Marchenko, Volodymyr; Pascual-Granado, Javier

"A Comprehensive Power Spectral Density Analysis of Astronomical Time Series. I. The Fermi-LAT Gamma-Ray Light Curves of Selected Blazars", *Astrophysical Journal* Supplement Series, Vol. 250, p. 1 (2020)

DOI: 10.3847/1538-4365/aba2c7

246 Thaller S.A., Andersson L., Pilinski M.D., Thiemann E., Withers P., Elrod M., Fang X., González-Galindo F., Bougher S., Jenkins G.

"Tidal wave-driven variability in the mars ionosphere-thermosphere system", *Atmosphere*, Vol. 11, Number 521 (2020)

DOI: 10.3390/atmos11050521

247 Thorsbro, B.; Ryde, N.; Rich, R. M.; Schultheis, M.; Renaud, F.; Spitoni, E.; Fritz, T. K.; Mastrobuono-Battisti, A.; Origlia, L.; Matteucci, F.; Schödel, R.

"Detailed Abundances in the Galactic Center: Evidence of a Metal-rich Alpha-enhanced Stellar Population", *Astrophysical Journal*, Vol. 894, p. 26 (2020)

DOI: 10.3847/1538-4357/ab8226

248 Toalá, J. A.; Guerrero, M. A.; Bianchi, L.; Chu, Y. -H.; De Marco, O.

"Chandra observations of the planetary nebula IC 4593", *Monthly Notices of the Royal Astronomical Society*, Vol. 494, p. 3784 (2020)

DOI: 10.1093/mnras/staa1024

249 Toalá, J. A.; Guerrero, M. A.; Santamaría, E.; Ramos-Larios, G.; Sabin, L.

"Extended X-ray emission from the classic nova DQ Her - on the possible presence of a magnetized jet", *Monthly Notices of the Royal Astronomical Society*, Vol. 495, p. 4372 (2020)

DOI: 10.1093/mnras/staa1502

250 Toalá, J. A.; Guerrero, M. A.; Todt, H.; Sabin, L.; Oskinova, L. M.; Chu, Y. -H.; Ramos-Larios, G.; Gómez-González, V. M. A.

"The Bubble Nebula NGC 7635 - testing the wind-blown bubble theory", *Monthly Notices of the Royal Astronomical Society*, p. 3041-3051 (2020)

DOI: 10.1093/mnras/staa752

251 Tobin, J. J. *et al.* (includes Díaz-Rodríguez, A. K.; Osorio, M.; Anglada, G.)

"The VLA/ALMA Nascent Disk and Multiplicity (VANDAM) Survey of Orion Protostars. II. A Statistical Characterization of Class 0 and Class I Protostellar Disks", *Astrophysical Journal*, Vol. 890, p. 130 (2020)

DOI: 10.3847/1538-4357/ab6f64

252 Tobin, John J.; Sheehan, Patrick D.; Reynolds, Nickalas; Megeath, S. Thomas; Osorio, Mayra; Anglada, Guillem; Díaz-Rodríguez, Ana Karla; Furlan, Elise; Kratter, Kaitlin M.; Offner, Stella S. R.; Looney, Leslie W.; Kama, Mihkel; Li, Zhi-Yun; van't Hoff, Merel L. R.; Sadavoy, Sarah I.; Karnath, Nicole

"The VLA/ALMA Nascent Disk and Multiplicity (VANDAM) Survey of Orion Protostars. IV. Unveiling the Embedded Intermediate-Mass Protostar and Disk within OMC2-FIR3/HOPS-370", *Astrophysical Journal*, Vol. 905, Issue 2, p. 162 (2020)

DOI: 10.3847/1538-4357/abc5bf

253 Torralbo I., Perez-Grande I., Gasent-Blesa J.L., Piqueras J., Sanchis-Kilders E., Rodriguez P., Lopez A.

"Thermal Analysis of the Solar Orbiter PHI Electronics Unit", *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 56, Number 8693551, p. 186-195 (2020)

DOI: 10.1109/TAES.2019.2911734

254 Tous, J. L.; Solanes, J. M.; Perea, J. D.

"The local universe in the era of large surveys. I. Spectral classification of S0 galaxies", *Monthly Notices of the Royal Astronomical Society*, p. 4135 (2020)

DOI: 10.1093/mnras/staa1408

255 Trifonov, T. *et al.* (includes Bauer, F. F., Amado, P. J. and Rodríguez-López, C.)

"The CARMENES search for exoplanets around M dwarfs. Dynamical characterization of the multiple planet system GJ 1148 and prospects of habitable exomoons around GJ 1148 b", *Astronomy and Astrophysics*, Vol. 638, p. A16 (2020)

DOI: 10.1051/0004-6361/201936987

256 Vega-García, L.; Lobanov, A. P.; Perucho, M.; Bruni, G.; Ros, E.; Anderson, J. M.; Agudo, I.; Davis, R.; Gómez, J. L.; Kovalev, Y. Y.; Krichbaum, T. P.; Lisakov, M.; Savolainen, T.; Schinzel, F. K.; Zensus, J. A.

"Multiband RadioAstron space VLBI imaging of the jet in quasar S5 0836+710", *Astronomy and Astrophysics*, Vol. 641, p. A40 (2020)

DOI: 10.1051/0004-6361/201935168

257 Vernazza, P. *et al.* (includes Duffard, R.)

"A basin-free spherical shape as an outcome of a giant impact on asteroid Hygiea", Nature Astronomy, Vol. 4, p. 136-141 (2020)

DOI: 10.1038/s41550-019-0915-8

258 Vielfaure, J. -B. *et al.* (includes Kann, D. A. and de Ugarte Postigo, A.)

"Lyman continuum leakage in faint star-forming galaxies at redshift z = 3-3.5 probed by gamma-ray bursts", *Astronomy and Astrophysics*, Vol. 641, p. A30 (2020)

DOI: 10.1051/0004-6361/202038316

259 Von Clarmann T., Degenstein D.A., Livesey N.J., Bender S., Braverman A., Butz A., Compernolle S., Damadeo R., Dueck S., Eriksson P., Funke B., Johnson M.C., Kasai Y., Keppens A., Kleinert A., Kramarova N.A., Laeng A., Langerock B., Payne V.H., Rozanov A., Sato T.O., Schneider M., Sheese P., Sofieva V., Stiller G.P., Von Savigny C., Zawada D.

"Overview: Estimating and reporting uncertainties in remotely sensed atmospheric composition and temperature", Atmospheric Measurement Techniques, Vol. 13, p. 4393-4436 (2020)

DOI: 10.5194/amt-13-4393-2020

260 Wielgus, M. *et al.* (includes Alberdi, A.; Gómez, J. L.)

"Monitoring the Morphology of M87* in 2009-2017 with the Event Horizon Telescope", *Astrophysical Journal*, Vol. 901, p. 67 (2020)

DOI: 10.3847/1538-4357/abac0d

261 Williams, D. R. A.; Baldi, R. D.; McHardy, I. M.; Beswick, R. J.; Panessa, F.; May, D.; Moldón, J.; Argo, M. K.; Bruni, G.; Dullo, B. T.; Knapen, J. H.; Brinks, E.; Fenech, D. M.; Mundell, C. G.; Muxlow, T. W. B.; Pahari, M.; Westcott, J.

"The curious activity in the nucleus of NGC 4151: jet interaction causing variability?", *Monthly Notices of the Royal Astronomical Society*, p. 3079-3086 (2020)

DOI: 10.1093/mnras/staa1152

262 Worley, C. C. *et al.* (includes Alfaro, E. J.)

"The Gaia-ESO Survey: Spectroscopic-asteroseismic analysis of K2 stars in Gaia-ESO. The K2 Galactic Caps Project", *Astronomy and Astrophysics*, Vol. 643, p. A83 (2020)

DOI: 10.1051/0004-6361/201936726

263 Wunderlich, Fabian; Scheucher, Markus; Godolt, M.; Grenfell, J. L.; Schreier, F.; Schneider, P. C.; Wilson, D. J.; Sánchez-López, A.; López-Puertas, M.; Rauer, H.

"Distinguishing between Wet and Dry Atmospheres of TRAPPIST-1 e and f", *Astrophysical Journal*, Vol. 901, p. 126 (2020)

DOI: 10.3847/1538-4357/aba59c

264 Yelles Chaouche, L.; Cameron, R. H.; Solanki, S. K.; Riethmüller, T. L.; Anusha, L. S.; Witzke, V.; Shapiro, A. I.; Barthol, P.; Gandorfer, A.; Gizon, L.; Hirzberger, J.; Van Noort, M.; Blanco Rodríguez, J.; Del Toro Iniesta, J. C.; Orozco Suárez, D.; Schmidt, W.; Martínez Pillet, V.; Knölker, M.

"Power spectrum of turbulent convection in the solar photosphere", *Astronomy and Astrophysics*, Vol. 644, Number A44, p. A44 (2020)

DOI: 10.1051/0004-6361/202037545

265 Zapata, Luis A.; Rodríguez, Luis F.; Fernández-López, Manuel; Palau, Aina; Estalella, Robert; Osorio, Mayra; Anglada, Guillem; Huelamo, Nuria

"Tidal Interaction between the UX Tauri A/C Disk System Revealed by ALMA", *Astrophysical Journal*, Vol. 896, p. 132 (2020)

DOI: 10.3847/1538-4357/ab8fac

266 Zewdie, Dejene; Pović, Mirjana; Aravena, Manuel; Assef, Roberto J.; Gaulle, Asrate

"AGN and star formation properties of inside-out assembled galaxy candidates at z ← 0.1", *Monthly Notices of the Royal Astronomical Society*, Vol. 498, p. 4345-4355 (2020)

DOI: 10.1093/mnras/staa2488

267 Zouganelis, I. *et al.* (includes Bellot Rubio, L.; Orozco Suarez, D.; del Toro Iniesta, J. C.) Tsiropoula, G.; Tsounis, A.; Tziotziou, K.; Valentini, F.; Vaivads, A.; Vecchio, A.; Velli, M.; Verbeeck, C.; Verdini, A.; Verscharen, D.; Vilmer, N.; Vourlidas, A.; Wicks, R.; Wimmer-Schweingruber, R. F.; Wiegelmann, T.; Young, P. R.; Zhukov, A. N.

"The Solar Orbiter Science Activity Plan. Translating solar and heliospheric physics questions into action", *Astronomy and Astrophysics*, Vol. 642, p. A3 (2020)

DOI: 10.1051/0004-6361/202038445

Visiting scientists

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European Southern Observatory
01/10/2020 - 30/11/2020

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26/03/2020 - 31/10/2020

Denis Shulyak
Max Planck Institute for Solar System Research
03/03/2020 - 01/05/2020

Gary Anthony Fuller
University of Manchester
01/03/2020 - 30/04/2020

Brenda Namumba
South African Astronomical Observatory
22/02/2020 - 19/04/2020

Elisa Frattin
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08/01/2020 - 08/04/2020

Roberto Ortiz Moraes
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07/01/2020 - 06/03/2020

Paola Marziani
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18/11/2019 - 05/03/2020

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28/10/2019 - 20/01/2020

Mahmoudreza Oshagh
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16/07/2020 - 31/08/2020
03/02/2020 - 31/03/2020

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